The
GEOGRAPHICAL
MAGAZINE

FEBRUARY 1960 2/6

ALL CLASSES OF INSURANCE TRANSACTED

CAR & GENERAL INSURANCE CORPORATION, L^{TD.}

83 PALL MALL, LONDON, S.W.1

no passport needed . . .

The new and revolutionary NORMALAIR underwater Swimming Set, acclaimed by expert and novice alike both for its simplicity of operation and its many safety features, brings the exciting adventure of underwater exploration within the range of those of even the most moderate means. By virtue of its low cost, the NORMALAIR underwater Set provides you with the key to a vast and fascinating submarine world, hitherto the exclusive province of the wealthy sportsmen and professional explorer.

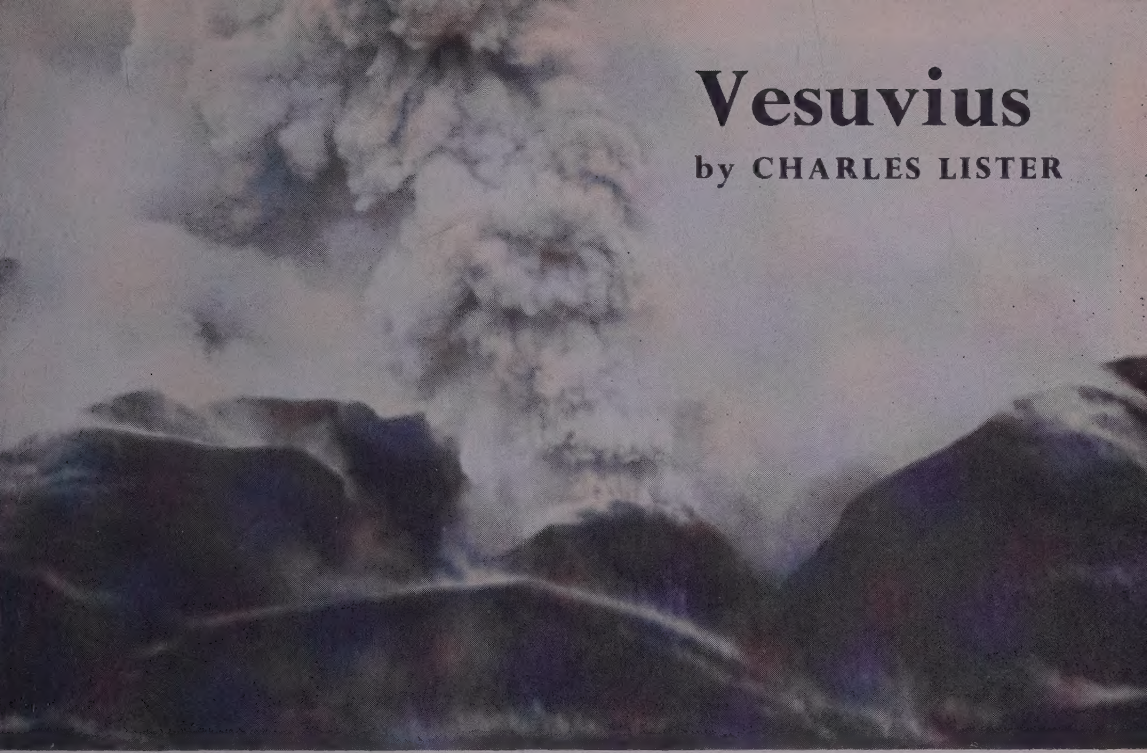
For full details write to

NORMALAIR
OF YEOVIL

INDUSTRIAL DIVISION,
27/31, MINSHULL ST.,
MANCHESTER, 1

Vesuvius

by CHARLES LISTER



Exclusive News Ag

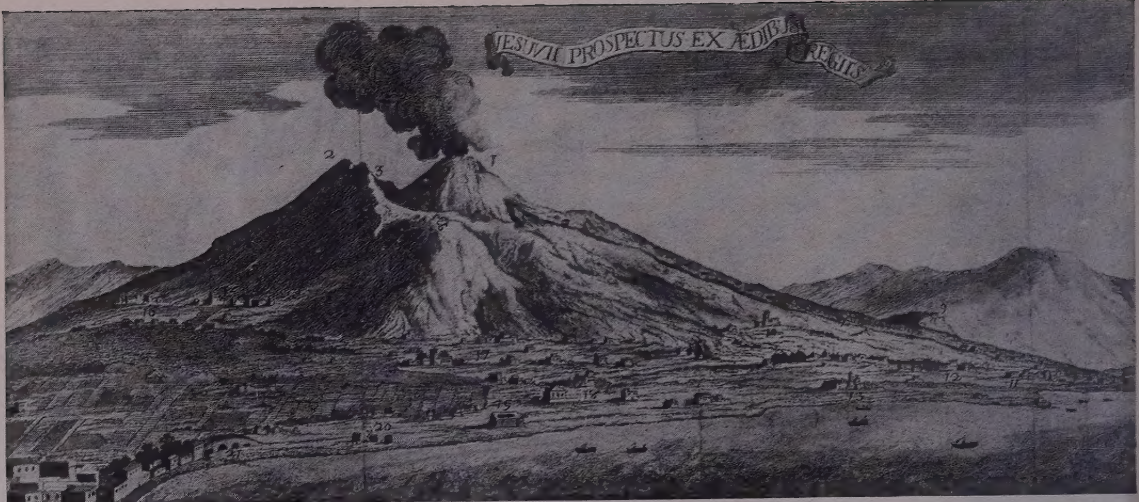
"VESUVIUS has to erupt by 1961," announced the smiling little man behind the mahogany desk. "By then it will be seventeen years since it last did so, and it is now working in eruptive cycles of between fourteen and seventeen years." Professor Imbo, senior seismologist at Vesuvius Observatory, and Lecturer in Geophysics at Naples University, gave a completely unworried smile and went on. "We don't expect anything big, although the temperature inside has been unusually high for some time—just a normal little affair like 1944, flames and lava, but nothing worse."

Another lecturer I spoke to wasn't quite so optimistic. "A constant 600° centigrade for months on end is rare," he said, "and it could be a bad sign, suggesting that the next eruption may be serious."

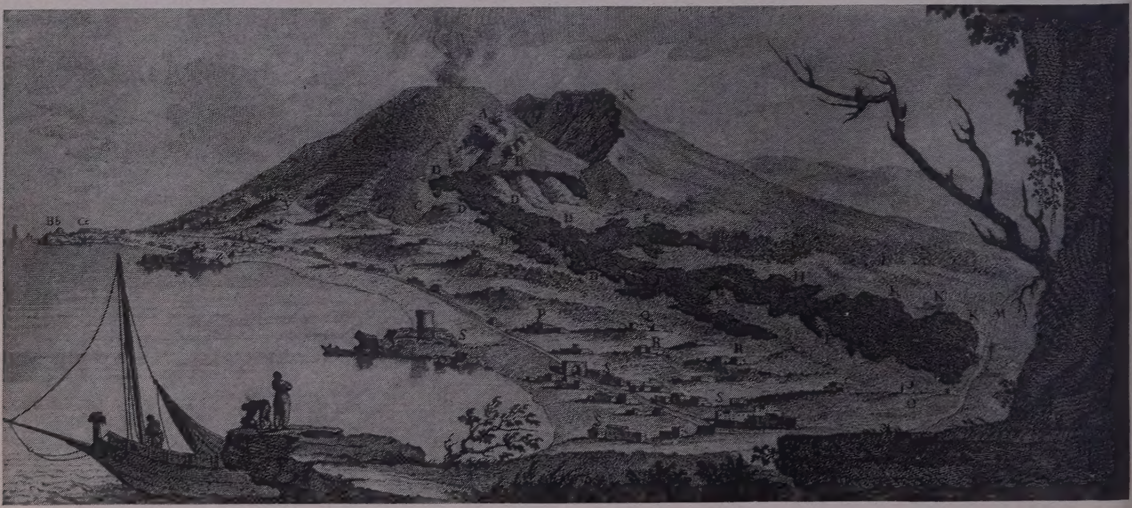
Meanwhile, eight miles south of Naples, rising in solitary splendour from the plain and dominating the surrounding countryside, Vesuvius stands aloof from the auguries and opinions of the physicists. Thirty miles in circumference and 4000 feet high, it adds character and beauty to the entire Bay of Naples. Without it the whole scene would lose its identity and its unique splendour. Yet this mountain is only one sign of the volcanic nature of a vast area: Capri is the result of a seismic upheaval of long ago, Ischia is an extinct volcano, the bay itself is thought to be part of a giant underwater crater, and to this very day just north of the city the earth heaves and groans, the mud bubbles and steam rushes out from underground.

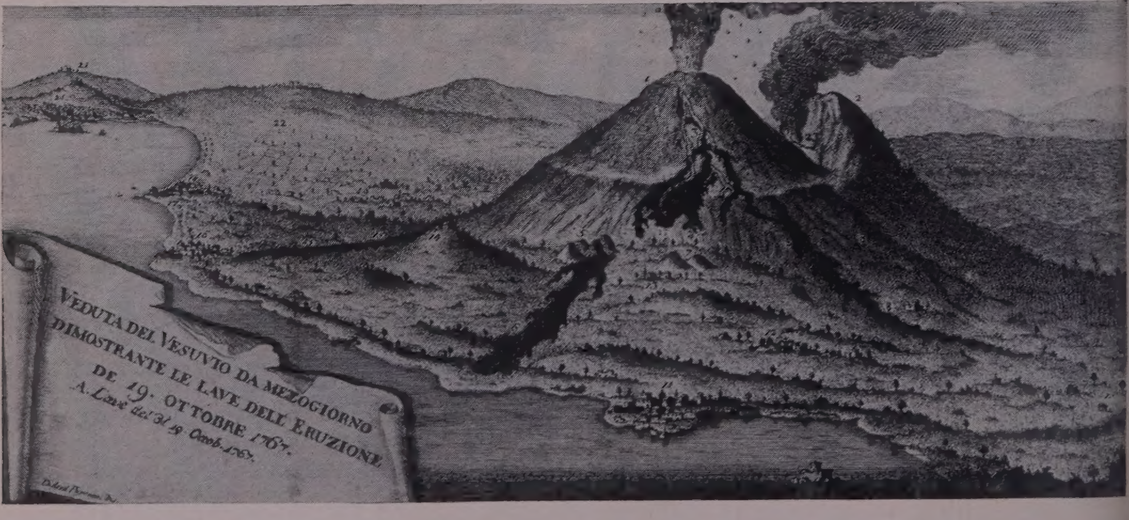
It is to Vesuvius, however, that the people of Naples pay indirect homage every year, for rather than put their faith in the prognostications of experts they prefer to treat their awesome neighbour with all due respect, fearing that the malignant spirit may arise without warning to deal out death and destruction for miles around. Accordingly, on the anniversary of his martyrdom, September 19, and again in May the cathedral is filled to capacity with people come to pray to Januarius, patron saint of the city, and to witness the miracle of the liquefaction of his blood, the sign that all will go well with Naples throughout the coming year. Should the blood in the reliquary remain solid the inhabitants regard it as sure proof that disaster is about to overtake them: an earthquake, famine, plague or, most likely of all, the wrath of Vesuvius.

Before the disastrous eruption of A.D. 79 which destroyed Pompeii, Herculaneum and Stabiae, Vesuvius was thought to be extinct, although three Roman historians of the period mention volcanic activity in the dim

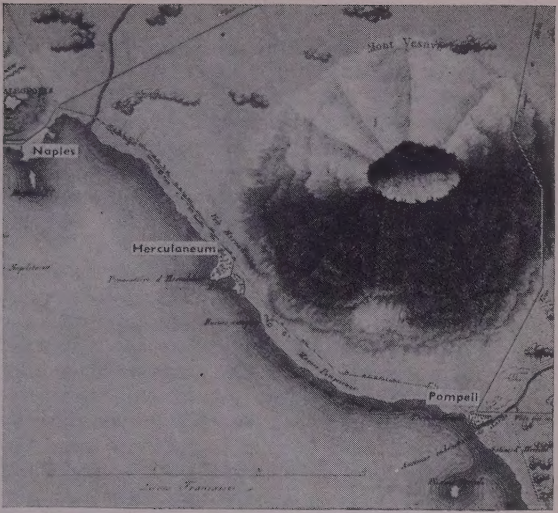

VESUVII PROSPECTUS EX ÆDIBUS REGIIS
1
2
3

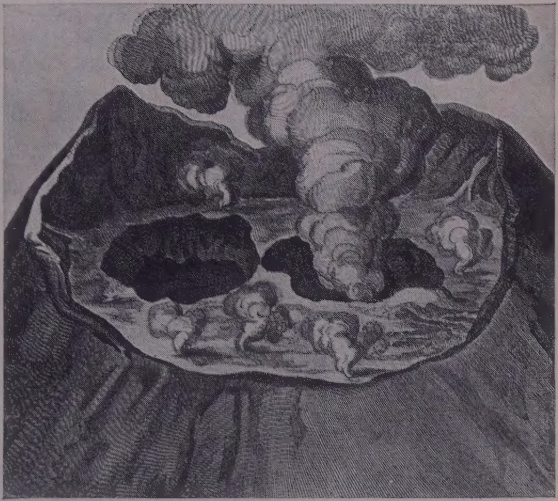
All six illustrations from the Naples Galleries

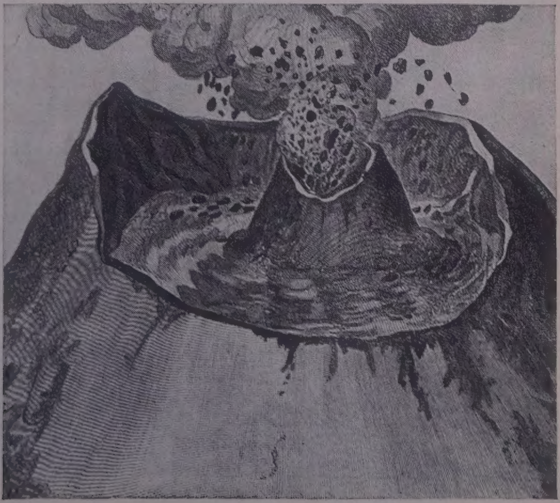



VEDUTA DEL VESUVIO DA MEZOGIORNO
DIMOSTRANTE LE LAVE DELL' ERUZIONE
DE 19. OTTOBRE 1767.
A. Lave del 31 19. Octob. 1767.
1
2

With each new outburst, Vesuvius changes shape; old features are destroyed and fresh ones are created. Only a fraction of the crater caused by the eruption of A.D. 79, the great curve of Monte Somma, is left, now almost dwarfed by the new cone, which in turn grows and shrinks, piled up with lava or battered by explosions. (Opposite) *Three 18th-century prints showing what was then left of the old crater, Monte Somma, and how the new cone grew out of it. The eruption of 1737 is probably the subject of the first print, and that of 1751 is shown in the second. The third illustrates one of the eruptions that occurred in 1766 and 1767, in which Sir William Hamilton nearly lost his life: the grim tentacles of older lava are seen on the mountainside, that of 1751 on the right flank, that of 1760 reaching blackly down to the sea in the foreground. The French aerial plan* (top, right) *is a reconstruction of Vesuvius as it must have looked before the eruption of A.D. 79, during which the entire south-western section of the crater was blown away. Finally,* (right) *two 18th-century engravings, showing the inside of the main crater: in one, steam is escaping from vents in the crust; in the other, a cone is belching rocks into a lake of lava*







and distant past. One of them notes that the stones at the summit were "as if burnt by fire", while another says quite openly: "long ago it arose and discharged flames over the country around." Modern research, however, has been able to establish the date more precisely, and suggests that in all probability it had last been active three or four hundred years before the birth of Christ.

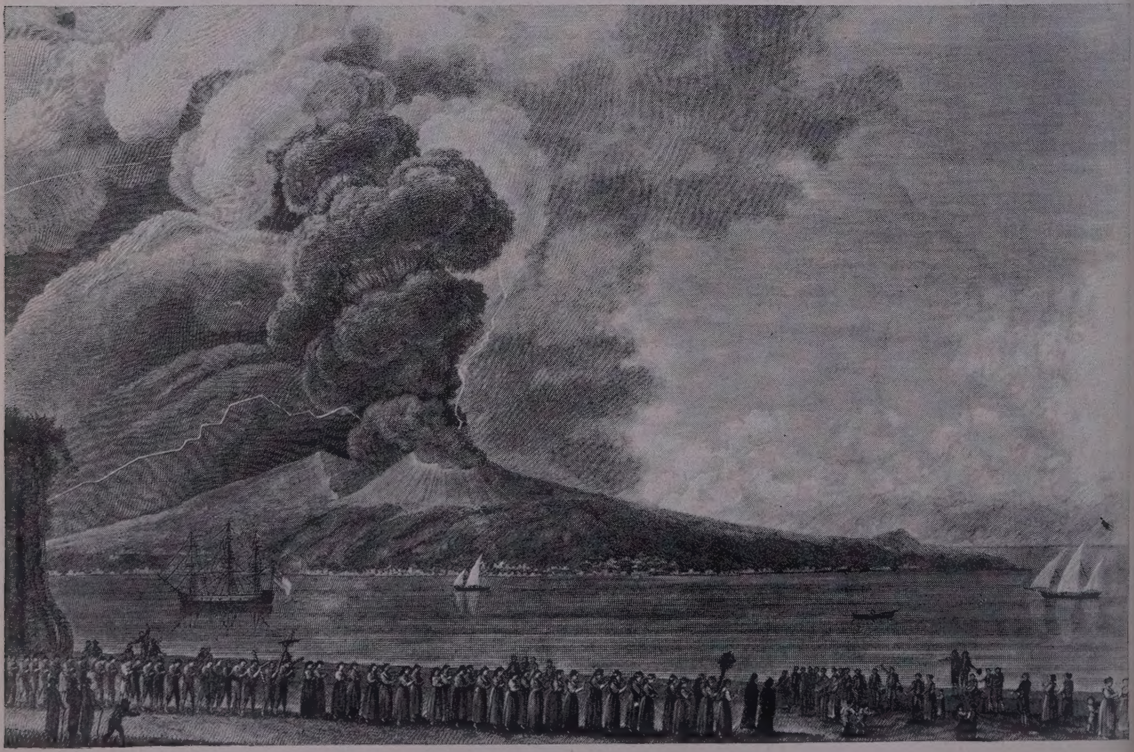
The shape of Vesuvius was not the same then as it is now; in fact it changes with every fresh eruption. Today the mountain's features show an active crater nearly one mile round, rising out of a very much older and larger crater—known as Monte Somma—which is over two miles in diameter. This is the crater left by the eruption of A.D. 79, before which it is thought that the mountain rose smoothly to a point well over 4000 feet high. It had an extinct crater, the inside of which was fertile and thickly wooded and full of various kinds of game including wild boar. Also the slopes were famous for their excellent wine, vouched for by the word "Vesuvinum" inscribed on many of the amphorae dug up at Pompeii. "Here Satyrs danced, and here was Venus' bower," says Martial lyrically, and in fact the summit was so overgrown that about 150 years before the great disaster Spartacus, leader of the Slave Revolt, was able to hide his followers inside the crater and, by using the natural cover it provided, to outwit the three thousand legionaries sent against him.

The first signs that the mountain's long sleep was ending came when a severe earthquake rocked the Bay of Naples in A.D. 63, the year before Nero made his début as a singer in the city. But the people still had no suspicion of what was to come one summer's day sixteen years later.

On that fateful August 24, with little warning, the entire southern half of the summit was ripped away by an enormous explosion and a deluge of ash and stones engulfed everything, burying towns and villages under a layer of hot cinders in some places over ten feet deep, and suffocating the inhabitants in a matter of moments. No lava flowed. Pompeii sank beneath a scalding

A picture "from life" of the discharge of ash which followed the great eruption of June 1794, seen from the north side of the Bay of Naples. The procession of penitents in the foreground bears witness to the view that natural calamities are sent as a punishment for human wickedness

From the Naples Galleries



debris of stones, and Herculaneum beneath waves of mud formed by the ash and the sea.

The only eye-witness account of what must have been one of the most dramatic and terrible disasters in the history of Europe has been left by Pliny the Younger, who was seventeen at the time. He tells how at one point the servants tied pillows on their heads with napkins to protect themselves from the falling ash. The air, according to one of his letters, was so black with dust that Capri was invisible from the mainland, and the sea "rolled back upon itself" with the violence of the earth's upheaval. A later writer, recalling the event, says: "the ashes were carried to Africa, Syria and Egypt, while in Rome the sun was so darkened that it was invisible a whole day."

Thus Vesuvius made its devastating entry into history; since when, in over eighteen hundred years, it has erupted nearly fifty times. Some of the earlier records are uncertain, but it seems that before the turn of the millennium there were only four cases of activity. In the year A.D. 203 its explosion into life was heard in Capua, twenty miles away; in 472 the ashes were carried as far as Constantinople; in 512 they reached the shores of Africa; and in 993 a chronicler claims that "fire from Vesuvius" damaged St Peter's in Rome.

The longest recorded period of calm the mountain has known began after an eruption in 1138, when, a Chronicle of Monte Cassino states, "fire was thrown out for forty days". Then followed five hundred years of serenity, and by the middle of the 16th century cultivation stretched to the summit once again, and the crater was again a fertile valley where cattle grazed and wild boar lurked in the thickets. There were also three lakes in the bowl of the crater, one of hot water, one of salt water, and one bitter. When the Italian Abate Braccini went up in 1612 he records that he found farmers and woodsmen working inside the crater which was itself so deep that it took him three hours to climb down and back again.

Twenty years later, however, there were signs that the mountain was awakening once more. A farmer who climbed to the top in 1631 found that the crater had filled up, and a few days afterwards rumbling noises were heard coming from deep inside the earth. By December 16 of that year the summit was glowing with fire, and smoke was already pouring out over the countryside. The Cardinal of Naples, happening to be in the area at the time, rushed back to the city to find that the blood of the Saint was boiling; and the Spanish Viceroy sent criers round the streets ordering the people to live cleanly as it was believed the last hour of the world had come.

When the eruption began it had years of pent up energy behind it and the explosion shook the houses of Naples to their foundations. "Vast stones were shot from the crater," says one observer, and seven streams of red-hot lava poured out, reaching the sea in less than an hour. Villages on the southern and western slopes were buried to a depth of thirty feet; in one a procession of three thousand people bearing an effigy of the protective Saint was swept away, and in another the lava ran two hundred yards into the sea, which, says Braccini, "boiled for days". While the houses swayed like ships in a storm men scourged themselves in the streets and the whole city was plunged into darkness. A stone weighing twenty-four tons landed in the village of Massa three miles from the summit, and in Nola, more than eight miles away, one fell which twenty oxen were unable to move. The ashes in places were twelve feet deep and they were carried as far south as Taranto, 150 miles away. In all it is estimated that more than twenty thousand people were killed. Then, as if not satisfied with an ordeal of fire, a few days later water gushed out of the crater and down the mountainside, in which people claimed to find seaweed and boiled fish!—a story not entirely to be discredited, as geologists have since found shells and other marine specimens buried in the mountain's discharge.

In that upheaval of 1631 the cone of the volcano lost two hundred and fifty feet and fell well below the surrounding ridge of Monte Somma. It soon began to build itself up again, however, by a fresh series of eruptions, one of which was witnessed from close quarters by Sir William Hamilton, then British Envoy to the Court of Naples. A devoted student of volcanic phenomena, he has left, among his many papers on the subject, a graphic account of the disaster of 1766, during which he very nearly lost his life. It was the sudden eruption of a minor crater far down the mountainside that took him by surprise.

> About noon I heard a violent noise within the mountain, and at a spot about a quarter of a mile off where I stood, the mountain split and a fountain of liquid fire shot up many feet high, and then like a torrent rolled on directly towards us. My guide took to his heels, and I followed close, and we ran near three miles without stopping.

eystone

One of the earliest photographs of Vesuvius in eruption, taken about a hundred years ago. The two onlookers seem completely unperturbed by the great rocks that are being hurled into the air. They are keeping still for the photographer: others, in ghostly outline, perhaps moved nervously

A short time later he refers to the speed of the flowing lava as equal to that of "the River Severn at the passage near Bristol". During this eruption the people of Naples set fire to the Cardinal's Palace because he had refused to bring out the statue of St Januarius as protection. When he did so two days later, however, Sir William records that "the eruption ceased the moment the Saint came in sight of the monster".

When the next upheaval occurred, twelve years later, ashes were carried one hundred miles across Italy to the east coast in two hours, and in 1794—the year Torre del Greco was completely destroyed for the fourth time—the lava is estimated to have run through the streets at the rate of one foot per second. Commenting on this eruption, a German traveller says the ash which fell on Vesuvius alone would have covered a circle seven miles in diameter to a depth of fifteen inches.

By the middle of the last century Vesuvius was becoming a well-known tourist attraction, and many letters and diaries of the period describe visits to it. A letter to the *Athenaeum* of March 21, 1868, says: "The mountain appeared to be bursting with subterranean energy; the entire summit was on fire; the blackened walls became red with heat, and while the lava surged—not flowed—over, as angry waves do over a sandy bar, heavy stones which the eye could select and measure were thrown up to a height of 1600 feet."

The visitors, who came from all over Europe, were disappointed if it did not put on a show for them during their stay. On the evening of April 25, 1872, one hundred and twenty carriages drove to the summit to gaze at the red-hot lava boiling angrily in the crater, while hundreds more sightseers went up on foot. A few hours later their hopes of seeing the mountain perform were more than fully realized. At 3.30 in the morning its behaviour changed suddenly from a smouldering reserve to an outburst of livid anger, and the thousands who had come to enjoy themselves were living in a nightmare.

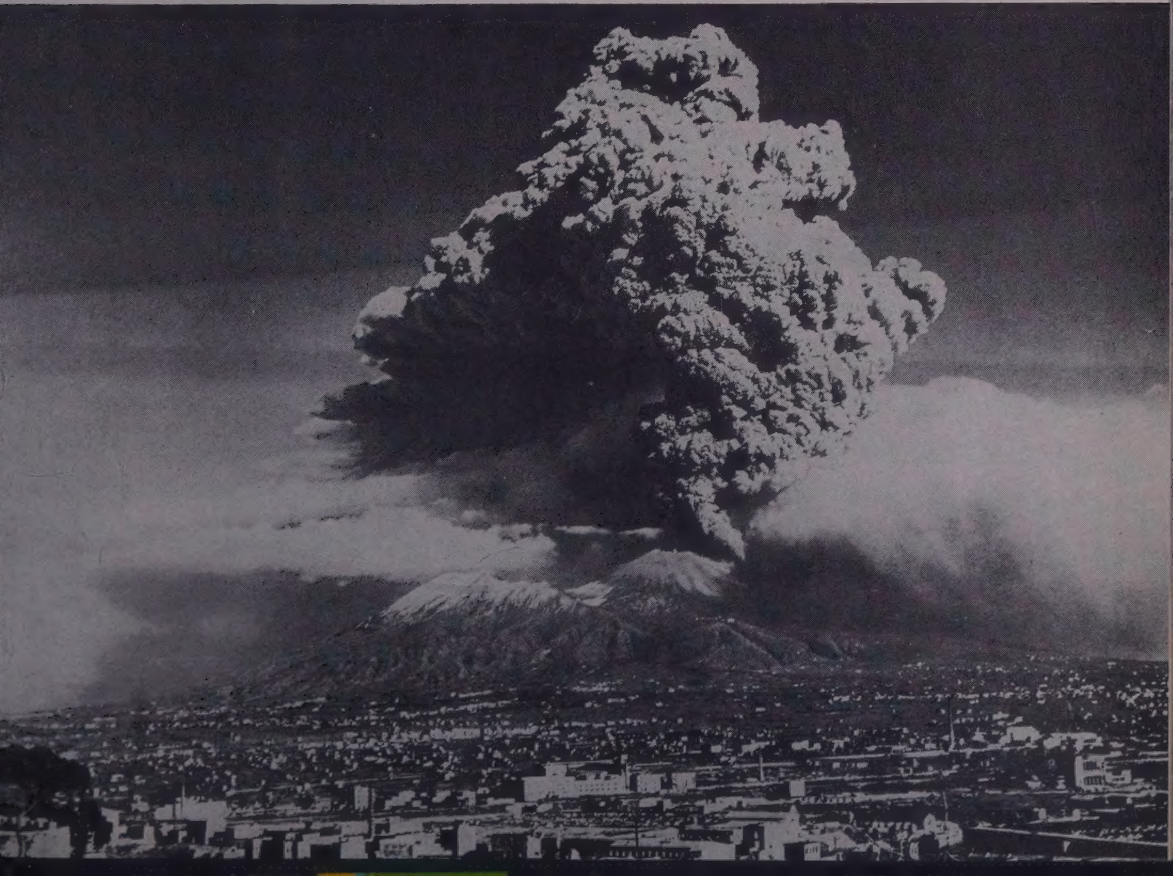
With no warning boiling lava spurted from two fresh craters near the summit, red-hot cinders rained down, a blinding smoke covered the mountain, and many of those who were still able to run for safety found their retreat cut off by streams of lava which burst out far down the slopes. Professor Palmieri, who was then in charge of the Observatory at the summit and had already pleaded with the spectators to leave before it was too late, says in his account that in a few moments "the building lay between two torrents of fire. The heat was insufferable, and the glass of the windows was hot and crackling, and in all the rooms there was a smell of burning." That night at least eight people died at the summit and many were injured, while the wave of boiling lava rolled on down the mountain at seven yards a minute.

That was eighty-eight years ago, since when there have been a further thirteen eruptions (averaging one every seven years), of which the most serious was in 1906 when hundreds of people were killed and over 300,000 tons of volcanic debris fell on Naples alone.

It is now sixteen years since Vesuvius last spread its reign of terror into the surrounding valleys and floodlit the bay at night with its glowing crater. This is supposed to be the longest period of calm since 1631. The first signs of the 1944 eruption came in January when fire was seen at the summit, but it was two months before activity began in earnest. On March 18 a pall of smoke descended on the villages round about and three fingers of lava began to creep down towards the sea. Two days later the molten mass, thirty feet high and two hundred yards across, was moving at a steady four yards a minute, and by next day it had increased its width to five hundred yards. Already 5000 people had been evacuated when the rain of ash and cinders began, some the size of walnuts, burying Pompeii, Torre Annunziata and Torre del Greco in debris several feet deep and blocking the main roads so completely that bulldozers had to be used to clear them.

A great cloud of smoke hanging like a pall over Vesuvius during the eruption of 1944, the most serious for over seventy years. Allied officials helped to evacuate civilians from villages and towns in danger, and organized emergency stations for the relief of the injured and the homeless

Imperial War Museum



nera Press

Pan. P

An aerial photograph (opposite) *of the crater of Vesuvius shows also the rim of Monte Somma.* (Above) *Seen from Naples, the volcano is deceptively tranquil, as it has been since March 1944, an eruption which was overshadowed by the war. And now, it is said, the cycle comes round again*

While the Neapolitans prayed for three days at the shrine of St Januarius, a column of smoke and ash rose 20,000 feet in the air, forming a dense cloud that one morning darkened the town of Bari 120 miles away and made Naples look like a giant coal-mine.

By March 26, eight days later, it was all over, leaving twenty-six people dead, crushed by fallen houses, and amongst the damage to the war effort over sixty allied aircraft were put temporarily out of action by falling stones. There was nothing for the inhabitants to do but set about reconstructing their homes and lives once again. They were neither hopeless nor resentful; instead they showed cheerful acceptance of the mountain's character, and were refreshed by the knowledge that the lava would bring fertility to the slopes and prosperity to their families.

As always the face of Vesuvius had changed again, this time adding 500 feet to its height, and widening the crater from eighty yards across to three hundred yards. The real magnitude of the forces of Nature at work throughout those eight days is best suggested by a sentence in Churchill's war memoirs.

> On March 24 a report to the Naval Commander-in-Chief stated: "The Naples group of Ports is now discharging at the rate of twelve million tons a year, while Vesuvius is estimated to be doing thirty million tons a day." We can but admire this gesture of the Gods.

Today all is quiet once more, save for the wisps of steam which rise from the many vents at the bottom of the 800-foot-deep crater. "Uncle is smoking his pipe," say the Neapolitans unconcernedly as on cold mornings they see the thin white plumes drifting lazily from the summit. The steam doesn't trouble them; it is the lack of it they fear. And less than two years are left, according to the men who study it, before it must wake up again, perhaps to bring fresh havoc to the Bay of Naples.

Meanwhile every house in the area keeps its small statue of the Saint on the wall in readiness, and on his anniversary thousands of Neapolitans will await the liquefaction of his blood with fevered expectancy. What Goethe described as "a peak of Hell rising out of Paradise" has taken its toll in the past, and will surely do so again.

Ethiopian Journey

by BARBARA MONS

In Gondar, once the capital of the Emperors of Ethiopia, one finds such names as the Gate of the Secret Chamber and the House of the Singer of King David; and on the walls of one of its churches a black-faced St George rescues an Ethiopian damsel

One day last April I was standing in the middle of Ethiopia on a temporary bridge of poles that was being laid over the Blue Nile a mile below its outlet from Lake Tana. A white man appeared and I asked him who he was. He said he was an engineer from Holland and was engaged in building the bridge; what was I? When I replied in my rather prim voice: "I'm a tourist", he sat down and mopped his brow and said: "Forgive me for laughing, but that is so funny. If you are a tourist you are certainly the first one I have seen around here."

This happy state of affairs will alter with the construction of more roads, hotels and other amenities of civilization (including the disappearance of groups of armed highwaymen called *shiftas*); but for the present Ethiopia is rich in wonders that are little known because most of them are difficult, and some impossible, for the ordinary person to see. A woman is not allowed, for instance, to set foot upon the islands of Lake Tana whose monasteries still contain their mediaeval treasures; and even a man, though he be furnished with letters of the highest authority, may reach with great difficulty some remote church only to find that "the man with the key" has vanished: so jealously do the priests guard the objects that are sacred to them. I hope to write elsewhere of the unique rock churches of Lalibela. Here I will describe a visit to Gondar, once the imperial capital, and to the Tisisat Falls of the Nile.

Gondar lies about twenty miles north of Lake Tana. At the south-east tip of the lake, where the Nile flows out, is the village of Bahar Dar. It transpired that, while we were to be in Gondar, a Point Four team intended to make their way up from Addis Ababa to Bahar Dar with four trucks and a helicopter—a journey that they expected might take anything up to four days—to set up a camp there in order to continue their study of the water-resources of the area. They kindly offered to take food and water for us so that we could fly down from Gondar to join them at Bahar Dar, where there was a primitive hotel in which we could sleep but could not eat; and to help us to get down to the falls.

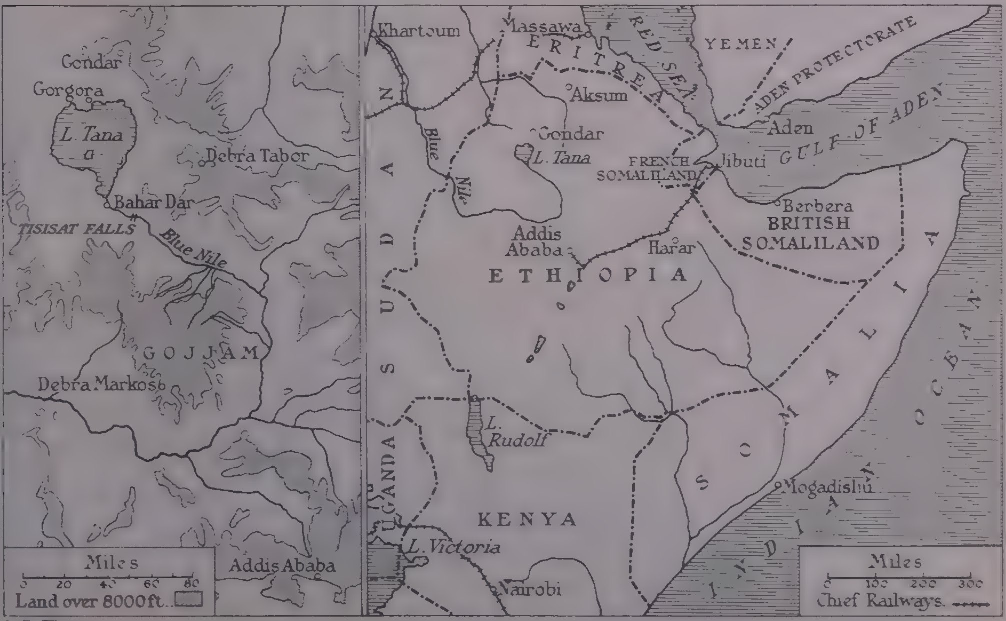
Unless one has an iron constitution and—more important—a great deal of time, one must do the major part of most journeys by Ethiopian Airlines. This is not, as flying so often is, dull. It would indeed be a dull person who did not experience an extraordinary sensation when flying low over the edge of the 8000-foot plateau upon which Addis Ababa lies. I never saw the most spectacular escarpment of all, which falls to the Danakil desert on the east side; but to the north the plateau is rent by the tremendous canyons that carry the tributaries of the Blue Nile.

We took the 7 a.m. plane from Addis Ababa for Gondar. A domestic flight such as this is the Ethiopian equivalent of a local train journey. You stop every fifteen or twenty minutes. In the seat beside us was a priest wearing a cylindrical brimless hat of white cotton topped with black leather, and carrying his large silver cross of office and a wooden prayer staff some five feet long with a transverse rest on which he could lean both wrists when holding his prayer-book before his eyes. In front of us sat a lovely girl clad in an elegant compromise with Western fashion: a gleaming white *shamma* bordered with black embroidery draped around the upper part of the body, ballet-length skirt to match, gold bracelets and earrings and very high-heeled white shoes. There was a deeply tanned European with a corn-coloured beard, in faded blue open-necked shirt and shorts and a bushwhacker hat. He was difficult to place: he seemed on familiar terms with everyone, but there was a certain arrogance in his bearing which denied the beachcomber. He turned out to be the former U-boat engineer Günther Deininger, a well-known local character whom we were to meet later on Lake Tana, where he operates the motor-boats for a company called Navigatana.

We touched down first at Debra Markos, the 'county town' of the province of Gojjam, landing on a rough sloping field. By a small shed stood a crooked pole bearing an air-sock whose usefulness must be somewhat limited, as the plane can only go out the way it came in. The town was not in sight. Alighting passengers departed on foot, holding black umbrellas, into a eucalyptus grove. After stretching our legs for twenty minutes we took off for Bahar Dar, where Herr Deininger got off. Here there was good landing-space and visible signs of habitation, including the bungalow where we were to sleep when we returned here. The next hop, to Debra Tabor, was only a quarter of an hour. Coming in low over the brow of a hill, scaring several donkeys and a black horse with an elaborate saddle, we hit the ground in a series of alarming bumps and came to a standstill by a group of men dressed in skins. (But one becomes used to these landings, and filled with admiration for the young Ethiopian pilots for landing at all.) Quite a number of people were waiting here. The priest disembarked and was greeted by two men who kissed him on both cheeks, then kissed the cross which he held up for them. Two other passengers rode off on mules, and a third, an elderly man in a shamma, put on a homburg hat and set off alone on foot in what I presume was the direction of Debra Tabor, though nothing was visible. A boy piled rocks into the tail of the plane, completely filling the lavatory with them, as the pilot had decided that we were now too light, with only our two selves and two new passengers who brought no luggage—a priest followed by his shaven-headed disciple carrying a cow-skin bible-box. After a while the pilot blew a little hooter in the cockpit, the two other officers rose from the grass where they had been lying, and we took off for the twenty-minute flight to Gondar.

Pale blue smoke curled upward from small bush-fires. We looked eastward at strangely shaped mountains, or down onto hot bleached grass and chequered brown fields waiting for the sower. We turned in over the north-east corner of Lake Tana and, three hours after leaving Addis Ababa, slithered to a stop in a cloud of dust at Gondar.

Gondar became the capital of Ethiopia in the 17th century under the Emperor Fasilidas, who reigned from 1632 to 1667. In 1603 the Jesuit priest Pedro Paez had arrived in the country on a mission from the King of Portugal. A Spaniard from Castile, Paez was a man of extraordinary talents and unflagging determination. Making his way up from Massawa on the Red Sea, he first settled at the Roman Catholic monastery of Fremona near Aksum, which had been established some decades earlier by Jesuit missionaries. Christianity had been the official religion of the Ethiopian state since the 4th century, the Ethiopian Orthodox Church having been associated since its foundation with the Egyptian Coptic Church of Alexandria. But the preaching of Paez so impressed the



A. J. Thornton

Emperor Za Dengel, who had just come to the throne, that he decided to become a Catholic. This not unnaturally caused a rebellion amongst the priests, and Za Dengel was killed. Undaunted in his resolve to convert the Ethiopians from one form of Christianity to another, Paez set to work on the next Emperor, Susenyos, with such success that in 1621 Susenyos embraced the Roman Catholic faith on behalf of himself and his subjects and announced his country's submission to the Pope. In this heyday of the Jesuit power in Ethiopia the Emperor tried by all forms of coercion to establish the new faith, but after twelve years he had to admit failure; he abdicated and died a Catholic. His son Fasilidas reverted entirely to the Orthodox faith, banishing the Jesuits and burning their books. He abandoned the historic capital of Aksum and moved the court to Gondar. Here he built the first of the astonishing group of palaces that still form the core of the city: astonishing because, even if one knows about them beforehand, they strike one at first sight as more feudal-looking, more unlike Africa, than anything one had expected.

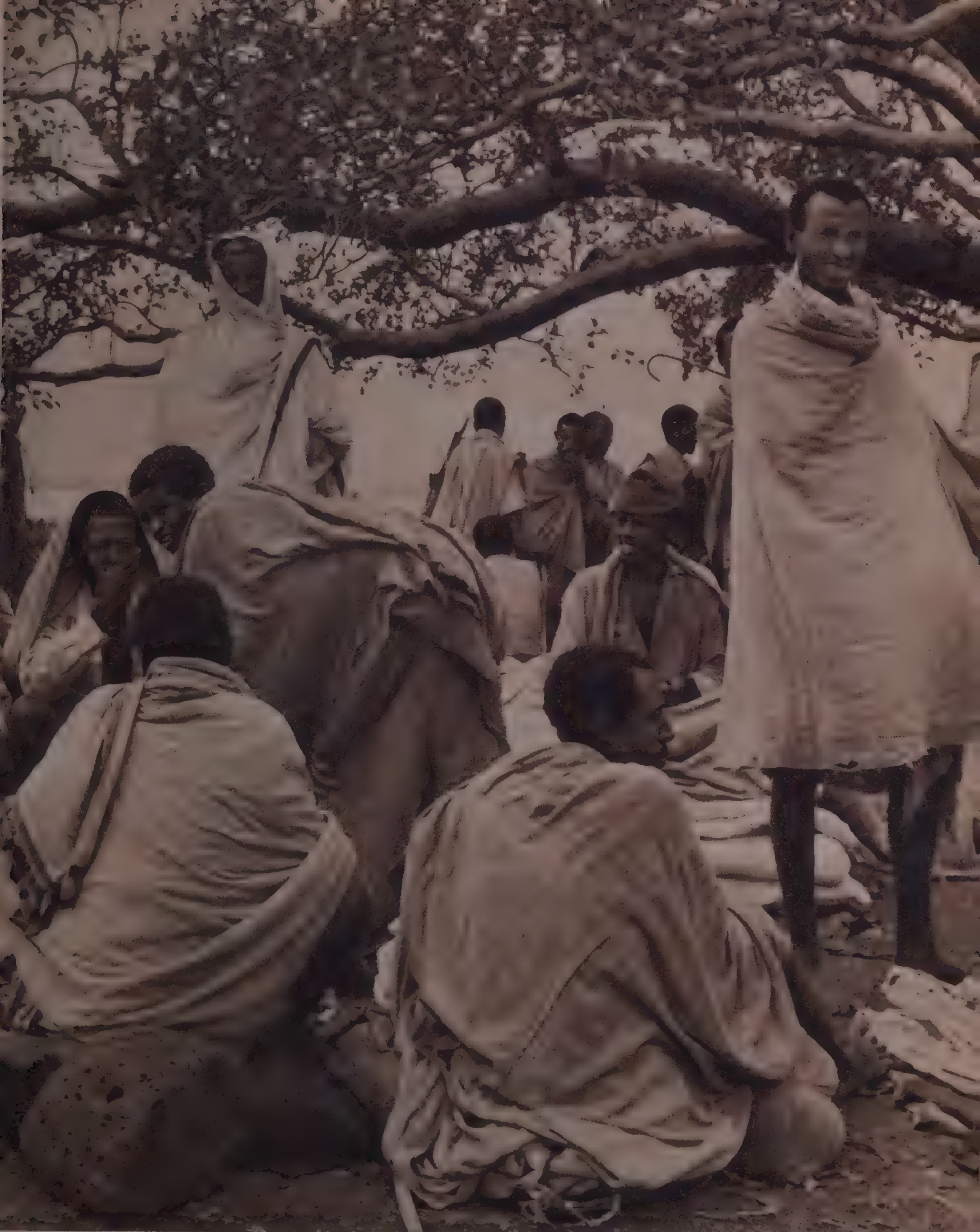
We were met at the airfield by the young wife of Dr Brooks Ryder, the American Director of the Hospital and Public Health Training Centre run under the joint auspices of the Ministry of Health, Point Four, and the W.H.O.; and drove the seven miles to Gondar in her station-waggon. The curving road gave a good view of the city stretched out along a hill. There are ugly stucco houses built during the Italian occupation, but one can turn one's back upon them when, in the central square, the high battlemented wall that encloses the palaces bursts into sight. However, we were glad of the hotel, a pleasant Italian building where the plumbing worked in our private bathroom and the bedroom windows looked out onto a creeper-clad pergola, orange trees neatly planted, caged birds and a lovely view through near hills to far mountains. (During our stay there were only three other guests: one Greek, one Egyptian and one Portuguese.) Immediately after our arrival we were called upon by Dr Otto Jäger, a scholarly man with iron-grey hair and a quiet voice, who has worked at the hospital here for over three years and is a mine of knowledge about everything of historical interest in Gondar and in the monasteries of Lake Tana. He escorted us to the palaces, where we were most grateful not only for the information that he imparted but because he was able to arrange for that most elusive figure in Ethiopia, the above-mentioned Man with the Key, to be there when we wanted to go in.

The walls originally contained twelve ceremonial gates whose names have a flavour of the Arabian Nights: the Gate of the Musicians, the Gate of the Funeral Commemorations, the Gate of the Secret Chamber, the Gate of the Pigeons, the Gate of the Judges, the Gate of the Spinners . . . Small trace of grandeur now remains, but it is impossible to wander among these curious buildings without a stirring of the imagination towards that semi-barbaric yet strangely stylized court that the Scottish traveller James Bruce saw in its decadence in the late 18th century.

The most intact of the palaces is the earliest, the palace of Fasilidas, a rectangular block with tall arched windows, pepper-pot turrets and one four-storey square tower. Though Portuguese artisans are thought to have been concerned in its construction, it has a Moorish air. It has been carefully restored and we were able to climb to the top of the tower. Then, over the rough grass that was once an imperial pleasure-garden, we walked among the remains of pavilions that bore strange names: the House of Espousals, the House of the Lions, the House of the Singer of King David . . . Beyond the Chancellory and the Library that were built by Yohannes, the son of Fasilidas, is the long low palace of the Emperor Bacaffa, who reigned from 1721 to 1730. An eccentric figure, given to communing with the stars, calling up the Devil and roaming his kingdom in disguise, he married a beautiful girl who later became famous as the Empress Mentaub and who was the Dowager Empress when Bruce arrived in Gondar in 1770. Her own small palace, now derelict but not in ruins, with wooden balconies and details oddly European, is the most appealing, the most evocative, of the buildings within the walls.

A mile or two outside the city the same Empress built the Kusquam palace, now an enchanting jungle-clad ruin. Beside it, crowning a hilltop, is a half-ruined round church, the precincts enclosed by a high crenellated wall with round turrets. Hot sunlight filters through juniper trees onto yellow grass, onto thorn and thistle and purple convolvulus, onto arched windows and doorways and niches of pink tufa half-strangled by the long fingers of the bush.

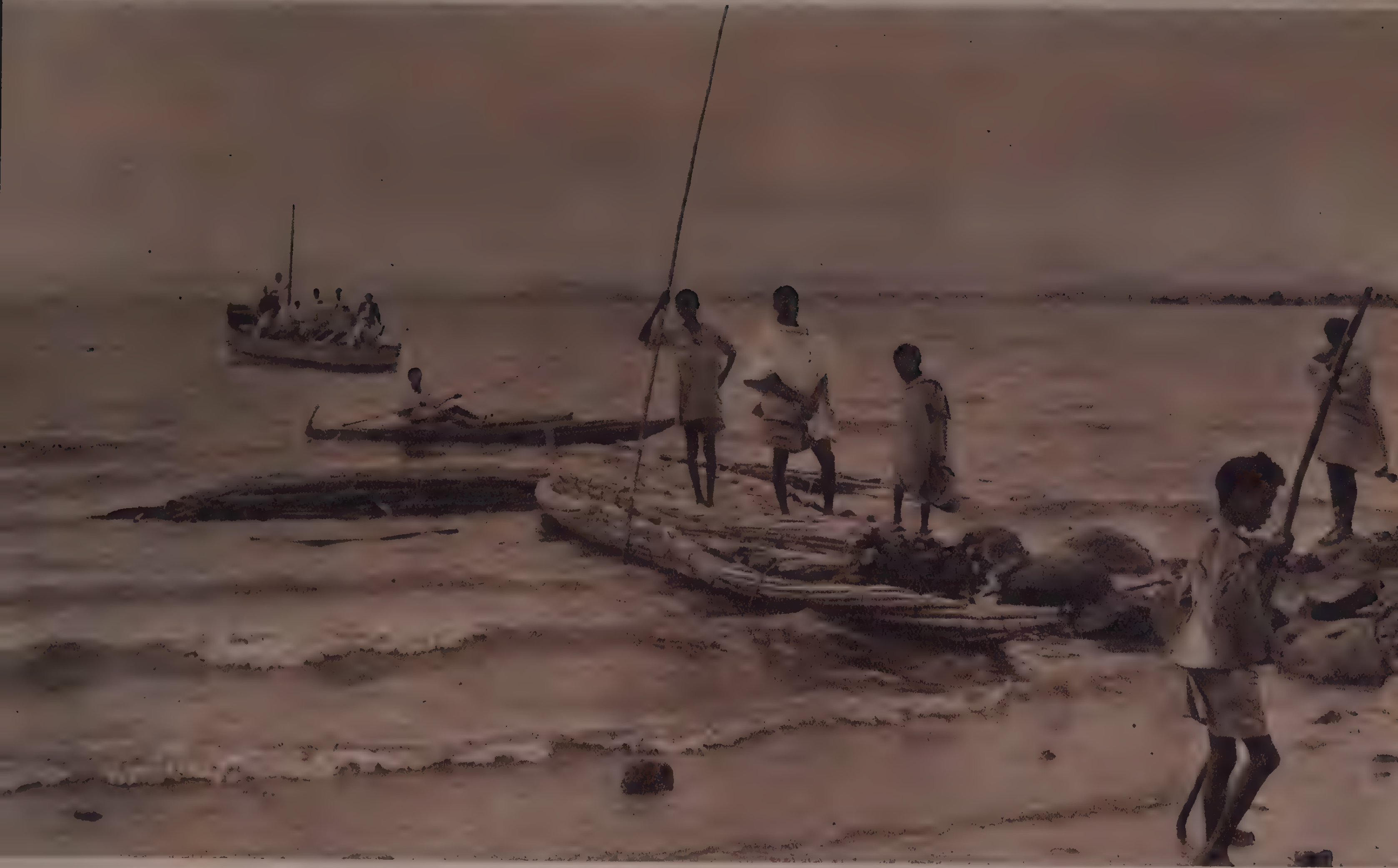
On the other side of Gondar, also on a hilltop, is the church of Debra Berhan, one of the few Ethiopian churches outside Lalibela that is rectangular in shape. Its interior is of particular interest, for 17th-century paintings



All photographs by Barbara Mon

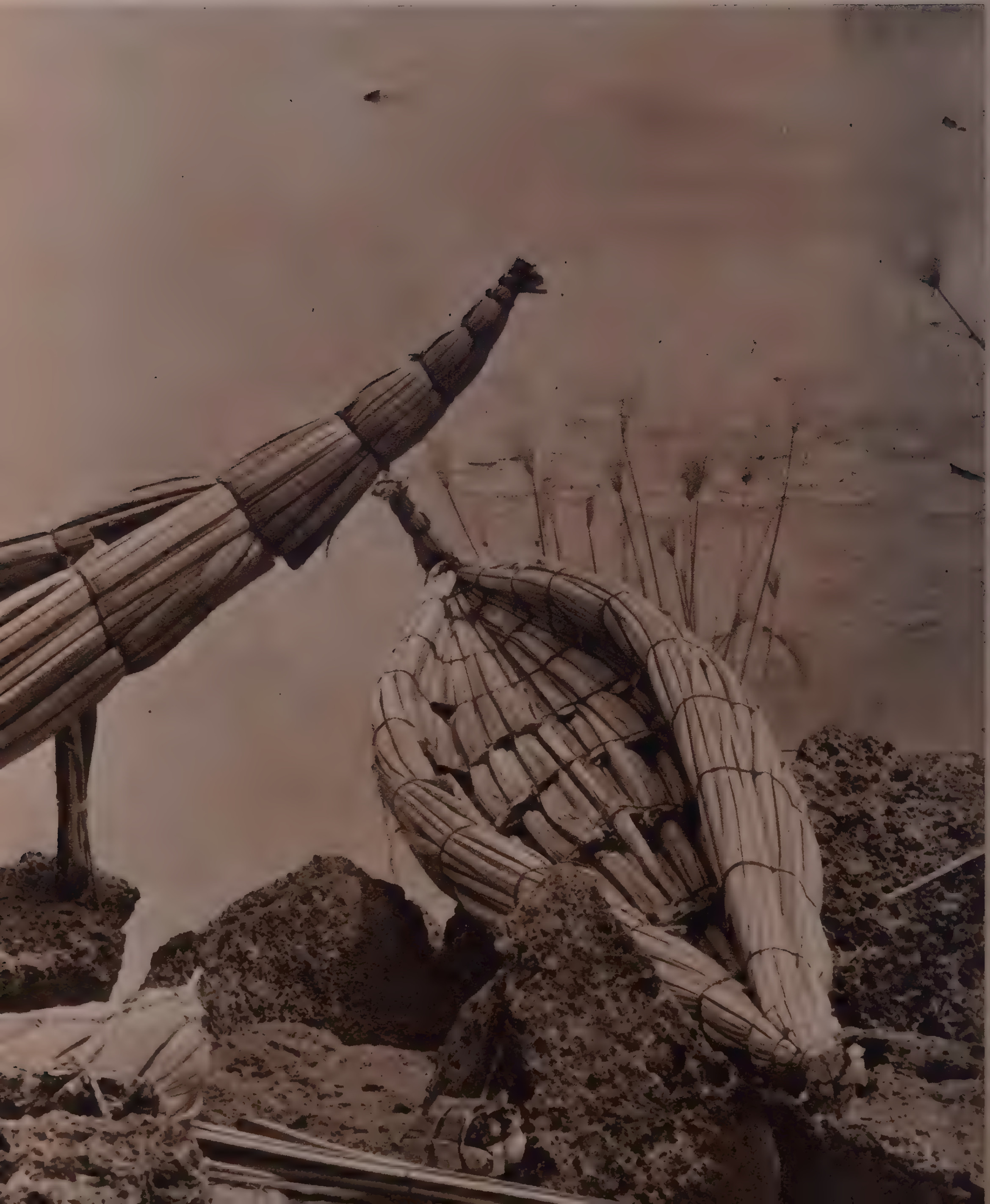
An Ethiopian market on the promontory of Zegi on Lake Tana. Some two thousand people flock to this weekly event to traffic in the coffee which grows in the shade of Zegi's tall trees

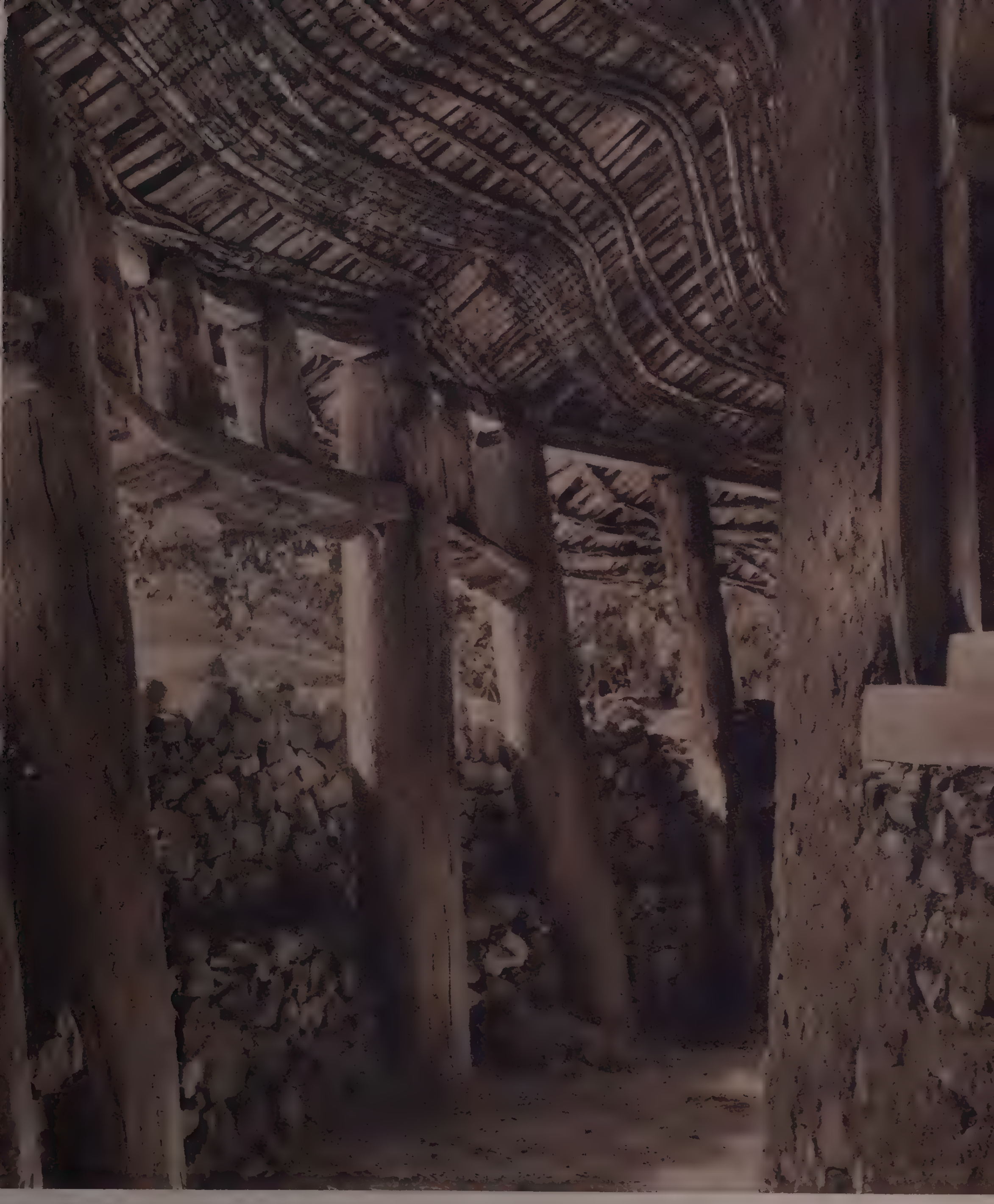
The airfield at Bahar Dar on one of the days when an aeroplane is expected. Ethiopian Airlines are the lifeline of communication with Addis Ababa



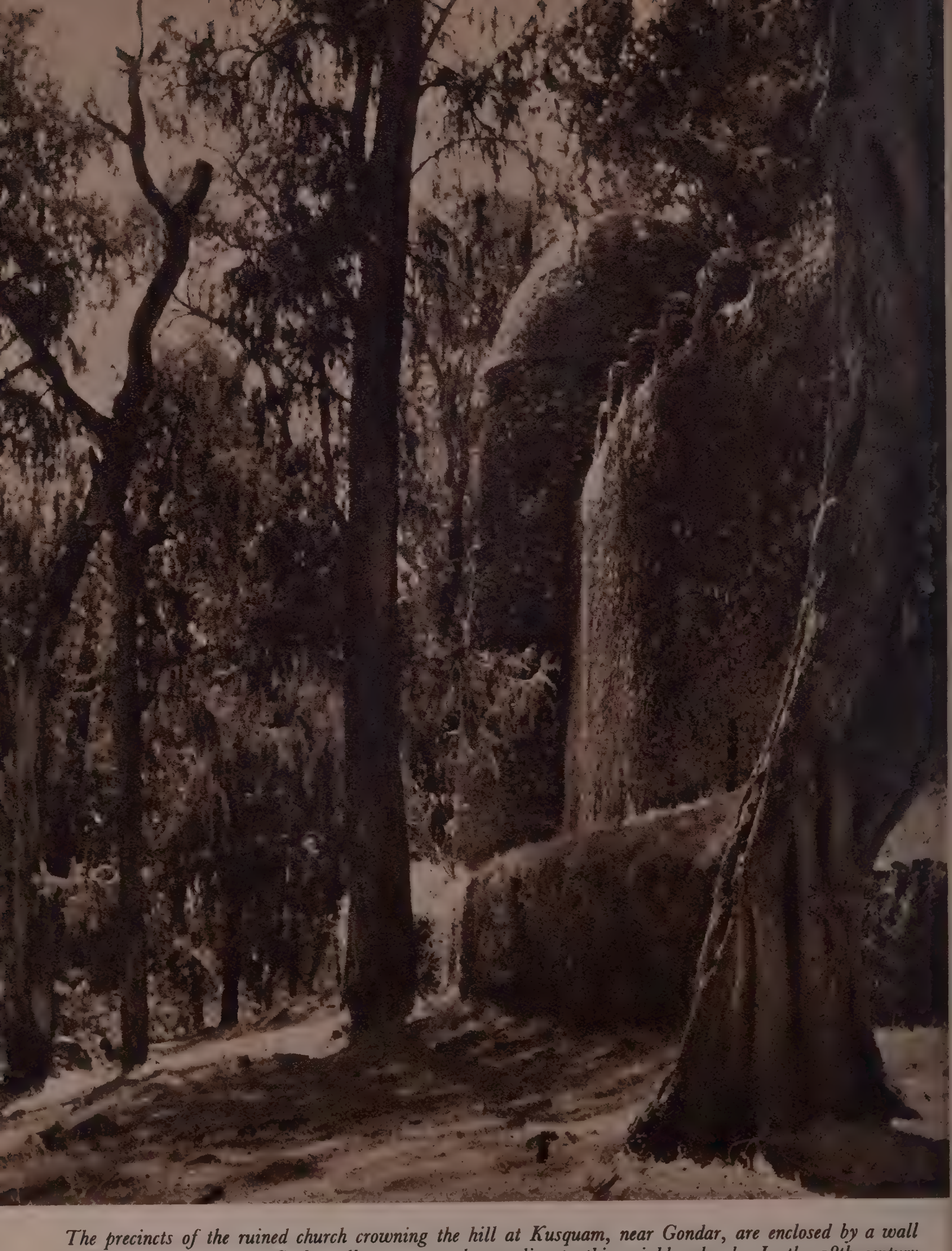
Ancient and modern craft on Lake Tana. Until the Italians introduced the motor-boat, the reed raft or tankwa *was the only form of vessel used*

Tankwas pulled up to dry upon the loose blocks of lava that form the southern shore of Lake Tana. This primitive craft quickly becomes waterlogged. It is made by first constructing the shell from bundles of papyrus stems bound with strips of bark, then filling the interior with similar bundles exactly fitting its shape. It is paddled or punted with a bamboo pole

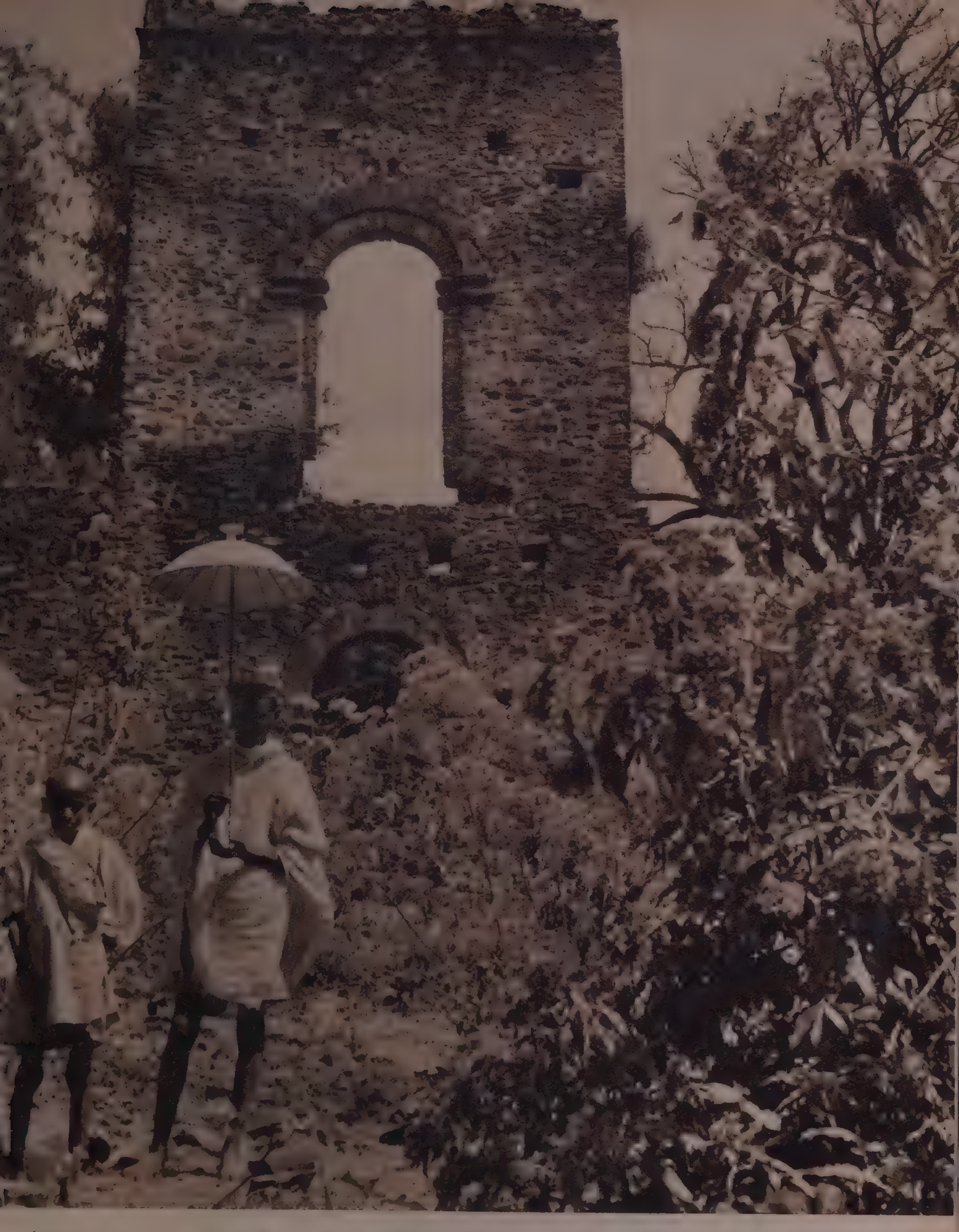




The taza *or outer circle of the church at Gorgora on Lake Tana. The typical Ethiopian country church is circular with a thatched roof, and has three divisions: the outer circle, which serves as a porch or ambulatory; the* kidist, *or inner circle where communicants assemble; and the* kidist kidisan, *or sanctuary, which the layman is never permitted to enter*



The precincts of the ruined church crowning the hill at Kusquam, near Gondar, are enclosed by a wall with pepper-pot turrets. Such walls appear to be peculiar to this neighbourhood. In the 18th century Gondar was known as "the city of forty-four churches", Kusquam being the mother church. It was plundered and burnt by the Emperor Theodore in 1866, after which Gondar's glory became a matter of history



Amongst the ruins of Kusquam. In the 18th century, when Gondar was the capital of Ethiopia, the Empress Mentaub founded the abbey of Kusquam, lined its church with blue silk, and adorned it with riches. She also built here an elegant small palace in which James Bruce of Kinnaird, on his way to look for the source of the Nile in 1770, found respite from the increasing savagery of life in Gondar

The Blue Nile from the bridge of Fasilidas. The whole volume of water that has passed over the Tisisat Falls is compressed into this cleft cut in lava at the bottom of a canyon. The V-shaped canyon imprisons the river for 300 miles of its 1000-mile journey to Khartoum, where it joins the White Nile cover all the walls from floor to ceiling, to continue there as geometrical patterns on the transverse beams, between which black-eyed, woolly-headed, rather plain cherubs stare down from a crowded celestial sphere. Vivid colour is used for purely decorative purpose with no attempt at perspective: figures move along the same plane as flat pieces of material, great or small according to the age or importance of each character. The Old Testament is illustrated, and the Gospel stories from the miraculous conception to the crucifixion, where blood drips from the cross upon the skeleton of Adam. Among the saints the most familiar is St George, with black face and bright eyes, who skewers a Chinese dragon from which an Ethiopian damsel has taken refuge in a tree.

Like Kusquam, Debra Berhan is approached by a steep stony track impossible for an ordinary car but negotiable by Mrs Ryder's German DKW jeep. Travelling in this high open vehicle over rough roads was like riding a bucking horse; with the windscreen laid flat it was exhilarating at all times, but especially at night under a cold black sky resplendent with stars. The longest trip we made in it was the drive to Gorgora on Lake Tana, to go out by boat to the headland on which Pedro Paez built a great palace for the Emperor Susenyos in 1614.

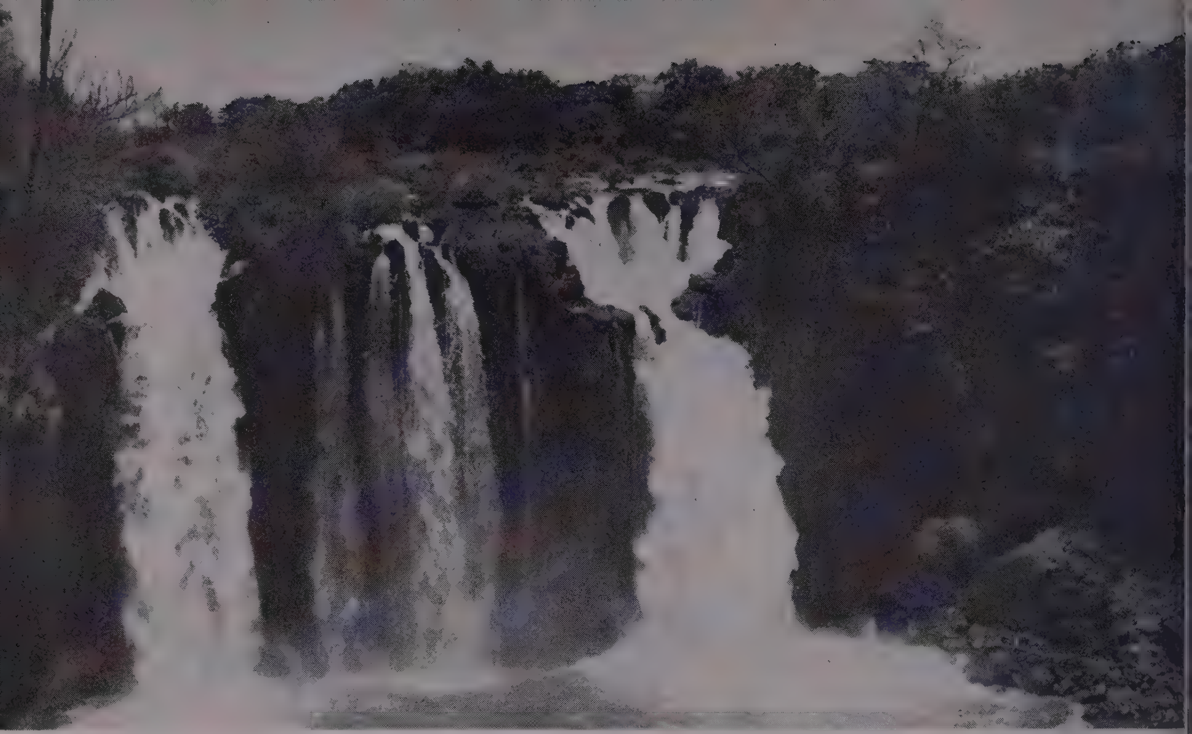
For this excursion we left Gondar early one morning, and before the sun was high the silver sheet of water lay just over the next hill. In the village of Gorgora there is a pleasant example of the typical Ethiopian round thatched church. These churches are composed of three concentric divisions, only the priests being allowed to enter the inmost recess which houses, in a wooden tabernacle, the consecrated slab of wood or stone that represents the Mosaic Tables of the Law. This is never exposed to view, but it is carried abroad, covered with a cloth, at the festival of the Epiphany. The Gorgora church stood near the shore, shaded by immense trees. At the small jetty a grey tin tub rode at anchor awaiting us by arrangement. The two young Ethiopians in charge of it started the single-cylinder diesel engine and we set out to round the Gorgora peninsula in a westerly direction.

The high-water level of the lake is 6002 feet above sea-level. We were glad of the fine weather, for there were forty miles of open water to the south of us and big breakers pound the rocky shore-line when the wind rises. (This can happen very suddenly: two days later the Navigatana boat that left Bahar Dar for Gorgora sank off the island of Daga with the loss of six lives.) We passed small islands with nice names: Araba Duba and Lik Abo; Jelu, which was once inhabited by a pirate chieftain called Jelu who fortified it with walls; Birgida Mariam, a tree-clad cone on which a church was founded by the Emperor Amda Seyon in the 14th century; Desait Giyorgis where, at water-level, stand the remains of a small fortress with loop-holed walls built by the Emperor Bacaffa, husband of Mentaub. On the mainland the shore was bright with green trees, some in blossom, against the yellow-brown scrub of the hills behind. We passed two or three *tankwas*, the reed rafts that were until recently the only craft ever seen on Lake Tana. Very light, and often elegant in shape, they are made entirely of bundles of dried papyrus-stems bound with narrow strips of the bark of the fig tree.

It was an hour-and-a-half's journey to the promontory on which the tall ruins of the palace of Susenyos are visible from far off. As we cruised round the thickly wooded slopes to land at an easy place, baboons, the only inhabitants, surveyed us impudently or turned to escort their families away. A track leads up to the top of the hill, where one is greeted by the extraordinary sight of the remains of a great Baroque building rising out of the African bush.

The central feature is a double wall, some seventy feet high and broad enough for a stairway to be contained inside it. Entering through an arched doorway at one end, we climbed the stairs and stood a long time upon the top of the wall. The view was magnificent. Among the yellow grasses the giant fig trees stood out like green domes, and the blueness of sky and water was heightened by contrast with the sun-bleached pallor of the land. Below us on one side were the remains of a rectangular wall fortified with turrets, which must once have encircled the Emperor's palace; on the other side we looked down upon the ruined choir vault of the church, palace and church being joined by the wall on which we stood. On the church side the wall is elaborately decorated with circular false windows, conch-shell niches, and carved friezes leading up to the suggestion of a domed roof, which was probably destroyed by the earthquake of 1704.

Paez not only conceived this remarkable building: he worked at its construction with his own hands, acting as stone-mason and training his workmen in the making and use of the tools. Not long after its completion the indomitable priest died here on Gorgora. His missionary success was soon to be swept



The Tisisat Falls of the Blue Nile below Lake Tana. The name Tisisat is based on Amharic words meaning "Smoke of Fire", from the appearance of the mist rising from the big fall, especially—

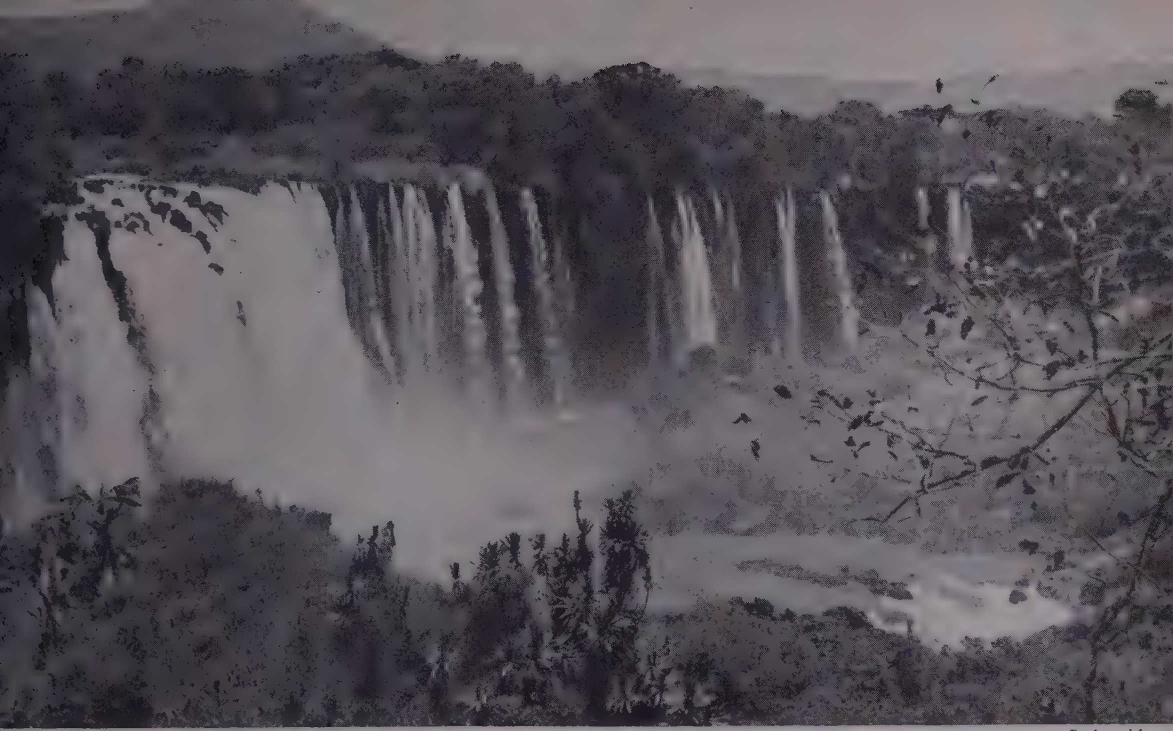
into oblivion, but he left for himself on this remote headland a stone memorial that has survived three-and-a-half centuries.

More difficult of access is another relic of Gondar's imperial days: the stone bridge built by the Emperor Fasilidas across the Nile below the falls, on the other side of Lake Tana. This was one of our several reasons for going to Bahar Dar for the next week.

As we came down on Bahar Dar airfield, after a rough flight in a transport plane, I was relieved to see the red body and shining antennae of the helicopter, for this meant that the good fairy called Point Four had arrived before us, so that we were assured of food and drinking-water, not to speak of iced canned beer. The team was led by a charming American, Lyle Mabbott of the U.S. Bureau of Reclamation, and comprised another American, Louis Ehrlich from Oregon (a picturesque character in a battered Stetson, gun-holster hanging from his cartridge-studded belt), two Frenchmen who were the pilot and the mechanic of the helicopter, and two young Ethiopian engineers, graduates of American universities. It was with the last two, and a native of Bahar Dar as guide, that we set out early next morning in a Land-Rover for the Tisisat Falls and the bridge of Fasilidas.

The falls are twenty miles downstream from the lake outlet. From the air I had remarked upon the smoothness of the track that led to them from Bahar Dar. In fact the surface is composed of black lava-blocks and overheated earth that has cracked and swollen into lumps, so that we were continually shaken as in a mixing-machine and it was soon apparent that the estimate of two hours for the twenty miles was no exaggeration. Now and again we crossed small stream-beds, the car taking the banks of boulders with the action of a determined mule. Large baboons lolloped over the grass. This is, I believe, typical lion-country, but no lion has been seen here for a long time, for it is comparatively populous. The colourless scrub was relieved at intervals by isolated fig trees of enormous size and by slender thorn trees with branches of terracotta red. Away to our left by the river (which was out of sight all the way) were oases of bright green foliage and tall palms.

By 9 o'clock it was intensely hot. It was a great relief when our guide indicated that we should park the car under a tree and get out. Even here the falls were inaudible and there was nothing to suggest the way. He



Barbara Mons

—in the early morning. This photograph, taken from an island near the right bank of the river, shows the main part of the 600-yard precipice, at a time when the river was at a very low level

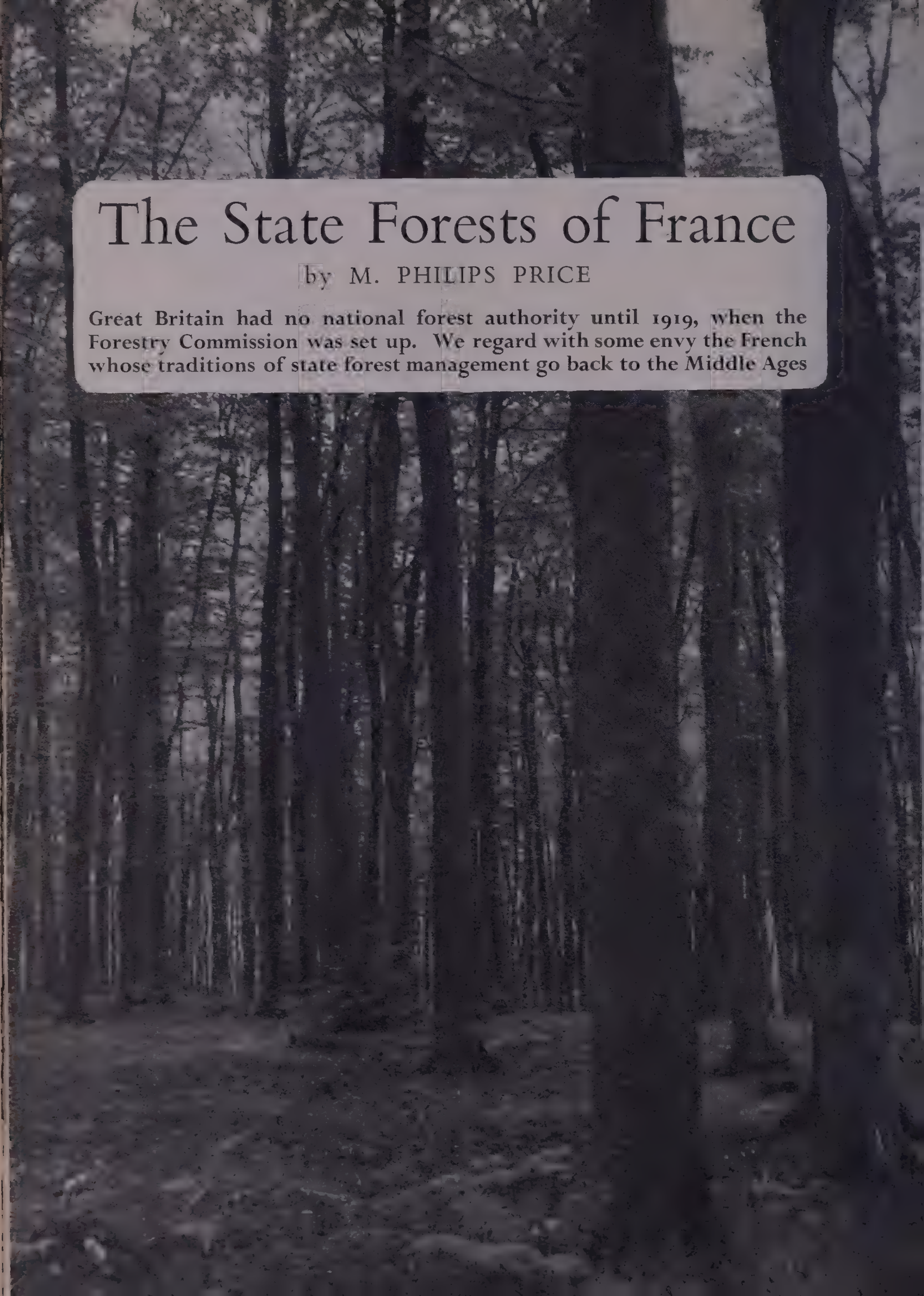
led us off through the bush for about a hundred yards, then down rocks and tree roots to emerge unexpectedly close to the narrowest but highest leap of water, a sheer drop of about 150 feet. We then climbed back, took a side-track out to the river and crossed over the narrow right branch of it by a temporary bridge of twigs and saplings that half floated upon the swiftly flowing water, which is smooth here some seventy-five yards from the top of the fall. We thus reached the wooded mound that divides the river, by far the greater part of its width being on the other side. By walking out towards the precipice we could see the main circle of the falls which, in innumerable separate cascades, make a first leap of 100 feet into a foaming basin where pale-green palm-clad peninsulas, hazy with spray, cleave the water before it takes the final fifty-foot plunge into the bottom of the gorge. Major Cheesman (*Lake Tana and the Blue Nile*, 1936) estimates the total width of the precipice to be 600 yards. He writes: "The falls are formed by a barrier of lava rock running . . . across the river's course, with a cliff-face on the downstream side, giving a sheer fall of 150 feet into a narrow gully which is the bed of a small tributary, the Alata, which comes in on the left bank and, picking up the huge volume of water that is rushing over the falls, carries it on at right angles to its previous direction of flow and parallel with the cliff-face." This gully continues as a narrow canyon for 300 miles downstream.

A mile below the falls Fasilidas, possibly with Portuguese workmen, built his bridge at a spot where the channel is so narrow that, according to local legend, a man once jumped across it and back again. It is almost incredible that the entire volume of water that has come over the falls can pass through this cleft, which at one point cannot be more than seven or eight feet wide. Until the war, when the approach and the main arch were destroyed, it was in regular use by mule caravans. Now even the encroaching bush cannot entirely obscure it, for the two remaining arches, though camouflaged with greenery, stand upon a wide shelf of lava rock. One's sense of discovering it for oneself adds to its charm. But, like Kusquam and the Gorgora palace, it needs attention if it is to be preserved. And one cannot help fearing that Ethiopia, in its desire for progress, may allow the total disappearance of these traces of the past that are so fascinating to the historian and the traveller.

The State Forests of France

by M. PHILIPS PRICE

Great Britain had no national forest authority until 1919, when the Forestry Commission was set up. We regard with some envy the French whose traditions of state forest management go back to the Middle Ages



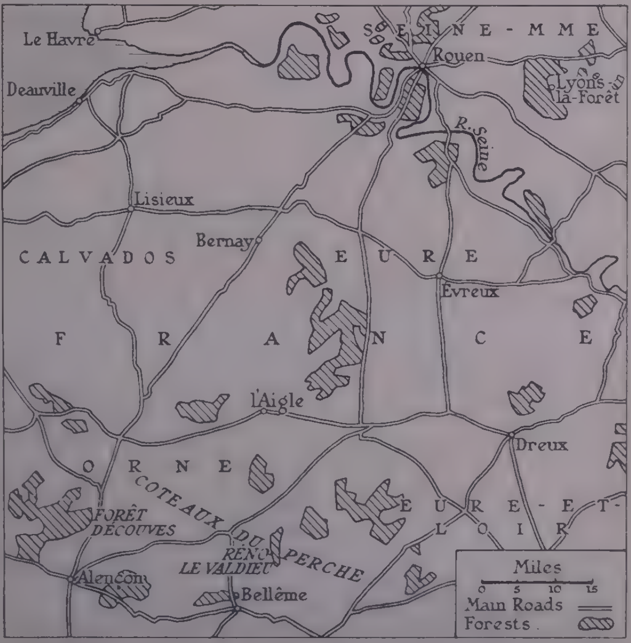
In the autumn of 1958 I made a journey in the north-west and north-centre of France. My primary object was to study the state forests of this area. I was given every facility by the Directeur-Général des Eaux et Forêts in Paris who prepared a programme for me, sent his forest-officers to meet me at the railway stations and provided me with transport to the forests. In consultation with forest-officers I was able to gather much information about the research that is going on in the rural economy of France and particularly in the sphere of the state forests. During my journey I stayed in French villages and saw how intimately interlocked forestry and agriculture are, at least in the part of France that I was visiting: people in the same village are engaged in these two occupations side by side, and wood, carpentered on the spot, supplies many of the farmer's tools.

From the coast of the English Channel to the basin of the Loire the climate is very like that of the south and west of England, being maritime and subject to the influence of the Gulf Stream. If you go by train from Rouen to Alençon or drive along the country lanes round l'Aigle and the Forêt d'Écouves in the Orne Department, you might be anywhere in Dorset, Wiltshire or the valley of the Severn. There is abundant growth of grass, uneven contours, small hills and valleys, with occasional glimpses of distant landscapes. There are orchards of cider- and cooking-fruit, small plantations and areas of upland with an extensive acreage of forest.

All along the north of Normandy inland from the coast for a hundred miles or so the rainfall is about 32 inches. The geological formations are chalk and Upper Jurassic with in places a considerable overlayer of loam and clay with flints. The soil-conditions are excellent for agriculture and forestry because there has been over the ages a considerable denudation of the chalk and the resultant overlying debris contains good plant-food. These conditions are most suitable for the growth of beech and here are some of the finest stands of this tree that can be seen anywhere.

In addition to the excellent physical conditions, northern France has inherited a tradition of good forest management. Before and during the Middle Ages common rights—the rights of commoners in forests belonging to their feudal overlords—became well defined in charters or deeds of sale or by prescriptive usage. Such, for example, was the important right to feed herds of swine on the acorns or beech-mast; pork being then the staple meat diet as it had been in Roman times, when the Gauls maintained an extensive export trade in salted pork to Italy. There were also numerous activities based on forest products—the making of hurdles, baskets, sabots and, above all, charcoal-burning, since charcoal was then of much greater economic significance—which required regulation if the forests were not to be gravely depleted by the artisans engaged in these occupations.

In the 14th century there were royal forests, Church forests, feudal forests (including those in which tenants enjoyed grazing, firewood or felling rights) and freemen's forests. In each case the owners were encouraged by royal ordinances to control cutting and in the royal forests themselves a forestry service under the control of a *grand-maître des eaux et forêts* was established by the 14th-century Ordinance of Melun. But the forests continued to be depleted and not until after the accession of Louis XIV (in 1643), when the need to build up a navy gave



A. J. Thornton

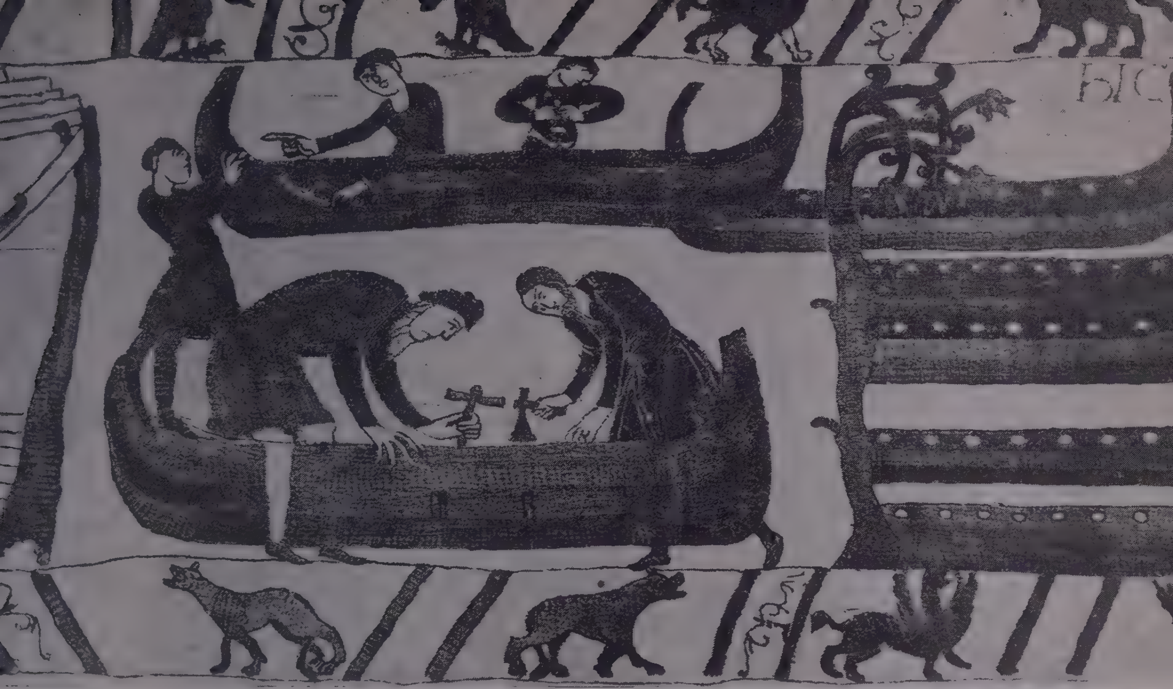
the problem a strategic aspect, was it effectively tackled. Then the king's chief minister, Colbert, in his effort to challenge the sea-power of the English and the Dutch, ordered a forest-survey of the whole country and in 1669 this resulted in comprehensive, positive forest legislation and a complete reform of the forestry service.

By the time of the Revolution in 1789, the Crown and the Church each held about 1,000,000 hectares (nearly 2,500,000 acres); over 4,000,000 hectares were privately owned; under 2,000,000 were communal forests. With the confiscation of Church property (proposed by Talleyrand, then Bishop of Autun) the area of communal forests was extended. It now covers 2,600,000 hectares as compared with 1,400,000 for the state forests and 6,800,000 in private ownership. Thus the communal forests, in which ownership by the *conseils municipaux* (parish councils) has replaced traditional common rights, are nearly twice as large as the state forests and their importance is all the greater since they are administered by the officers of the state Forestry Service on behalf, and with the consent, of the local communal authorities, to whom all receipts from timber sales are paid except for a small percentage retained to defray the cost of administration. Receipts from sales in the state forests are paid to the central administration.

The gross revenue of the state forests of France in 1957 amounted to 14,000,000,000 francs, while administrative and maintenance expenditure was 4,000,000,000, leaving a net revenue of 10,000,000,000 francs or some £7,326,000 at the current rate of exchange. The gross revenue for the communal forests that year was 16,000,000,000 francs, the net amount being 11,000,000,000 or £8,058,600. These sums, distributed so widely throughout rural France, cannot fail to affect the balance of local economic life; and the methods by which the timber sales are organized and regulated are therefore of special interest. Here is an eye-witness account by a British timber-merchant, Mr Geoffrey Calvert, of a recent annual timber auction at Évreux in the Forest of Lyons, once a favourite game-reserve of the Dukes of Normandy which, like other feudally owned hunting-forests, became a royal domain as political power was gradually consolidated in the hands of the kings of France. The forest is mostly beech.

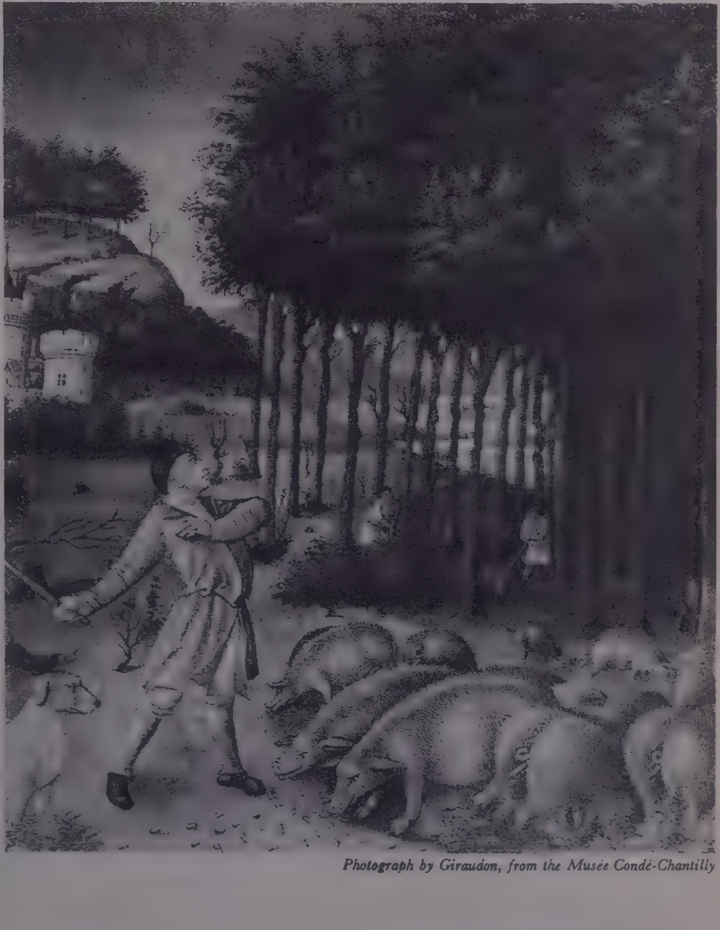
In preparation for the auction a catalogue by the Forestry Service officials had been made available, giving details of the cubic contents of each lot, worth from about £1500 to £4000 apiece and consisting of numbered trees, either standing or felled.

Arriving at the large hall, I was surprised to find that by the advertised time of starting it was full, containing probably more than three hundred timber-merchants. When, at the appointed hour, the doors were closed, the reason for the full attendance soon became



Victoria & Albert Museum

The Dukes of Normandy once owned great forest lands, the remains of which are now administered by their successors, the Government of France, through the Forestry Service. The Bayeux Tapestry (above) *illustrates in detail how timber from these forests was used in 1066 to build long-boats for William the Conqueror's invasion of England. Six centuries later, Louis XIV's ministers took steps to replenish France's dwindling forests and so provide for a navy against England. Though wooden ships and old enmities have disappeared, many aspects of France's forest economy are still unchanged. This early 15th-century illustration* (right) *from* Les Très Riches Heures du Duc de Berry, *a Book of Hours, shows some of the rural activities for November : meticulous trimming of the oak forests, and gluttonous swine feeding on the rich crop of acorns under the eyes of the bailiff and his stern dog*



Photograph by Giraudon, from the Musée Condé-Chantilly

In the countryside of southern Normandy, where the Orne in its upper reaches winds through willowed pastures between the soft downlands of the Coteaux du Perche, where mill-wheels groan and the cider-apple is in blossom, one could be across the English Channel, in the heart of Hardy's Wessex

The villages of the Orne cluster round their little churches. Often a house is kept aside by the mayor, and the inhabitants gather there to discuss crops, taxes and topics of the day

apparent as an ancient timber-merchant drew a lot number from a *képi* handed down from the platform where the officials were seated. This lot was put up first; and the sale proceeded in the numerical order of the catalogue until the 'advertised' lunch-time lot was reached; then back to number 1 in the catalogue; and so on till the morning's work was finished. This seemed to me a most practical way of getting everyone to the auction by opening-time and encouraging the maximum number of bidders.

As a lot was called, a junior forestry official would start intoning prices, beginning at an estimate somewhat above what it was hoped to get—"4,000,000; 3,900,000; 3,800,000" (francs), etc.—until a little further down the scale a merchant would pluck up his courage and shout "*Prends*" in a loud voice and walk up to the table at the foot of the platform to sign. In practice I found that no two persons called at exactly the same time and there was never an argument if two calls were very close together. Had a final decision been necessary, it would doubtless have come from the presiding official, a man of great dignity and character.

This system of 'Dutch auction' prevails throughout all the timber sales held by the French Forestry Service. By means of it, and by carefully considering the probable demand, the forestry officials can to a great extent control the prices of their standing timber. Their comprehensive organization and the long-term view which they can afford to take enables them to adjust the timber on offer to the general state of the economy, to increase their sales in a good year and to avoid putting too much on a depressed market. Before the sales come along the timber-merchants know that the Service will not try to add to stocks which are already embarrassing their holders.

By the end of the day a very large quantity of timber had changed hands. The forestry officials filed out, to be saluted punctiliously by the local policemen in the town square. The crowd of merchants dispersed and in the gathering gloom of the October evening little groups drifted about, the successful bidders explaining why they had thought it necessary to pay such high prices and the others doubtless reflecting on the determination required to purchase their needs at the sales at Rouen and Dieppe to follow in a few weeks. It was obvious that they all held the Forestry Service in extremely high regard and no-one seemed even to think of criticizing its powers or methods of sale. The rules of payment are considerate, this being split up into three-monthly or six-monthly instalments favourable to the small man of good character who cannot put down large sums at one time. All the beech has to be felled by March 31 in the ensuing year and the forest-officers exercise control over the method of

In the forests of Bellême and Réno-Valdieu stand giant oaks, some of which were planted in the reign of Louis XIV. One of these is dedicated to the English Forestry Commission

Although most of their forests are on good land, the French Forestry Service is particularly skilful in growing oak on poor upland soil. Here is such a forest on the plateau of Écouves

felling and extraction.

I can find nothing but praise for this system of sales, by which everyone concerned seems to benefit.

The system of forest management is equally remarkable. To take one example, in the beech forests of the region north and east of Rouen a method has been worked out whereby the forest regenerates itself. The excellent financial results are to some extent due to the economy of working, for over wide areas there is no expense in connection with replanting. The forest on reaching the age of about 180 years (the usual rotation is about 225 years) is gradually thinned over a period of thirty years. As the forest is opened out the beech-mast when it falls produces a carpet of little seedlings. Care is taken to do the thinnings after a good 'mast' year. By the time the last of the old trees have gone, there is a veritable jungle of young beech trees up to ten feet high which have all come up naturally. This means that no labour is employed except in thinning out the jungle of young trees. The felling and drawing out of the old trees is done by the merchant who buys the timber. Thus a self-generating process is evolved at a minimum expense.

In the middle stage of growth, when the beech forest is from fifty to eighty years old, it has to be thinned. I saw at Lyons-la-Forêt large quantities of thinnings ready to be transported to a pulp-factory at Rouen. I heard considerable fear expressed that that factory would not be able to compete with foreign pulp from countries which produce in greater bulk than France is able to do. It was an interesting sidelight on the attitude of one French industry to the establishment of common-market and free-trade areas.

South-east from Rouen you pass out of the valley of the Seine and cross a low plateau ridge called the Coteaux du Perche into the basin of the Loire. Round the provincial

There is in France a more intimate relationship between forestry and agriculture than one finds now in England. Auctions of timber from the state forests are geared to the economy of the locality and are well attended by farmers and small timber-merchants. Farm implements are often of wood, and thinnings from the forests are relied on to supply the coopers and carpenters town of Alençon there is a large extent of oak forest. Here the chalk is overlaid by a considerable thickness of clay with flints, and the low percentage of lime in this overlayer encourages oak rather than beech, which flourishes in a soil of higher lime-percentage. The rainfall here is slightly less than nearer the coast and is about 31 inches.

In the forests of Bellême and Réno-Valdieu are some of the finest stands of oak in the world. The rotation runs from 200 to 225 years and there are giants 250 years old. In fact they were seedlings in the reign of Louis XIV and no doubt they were looked on by the Chancellor of the Roi Soleil as potential timber-producers for a French navy to fight the English. Now one of these giants, which has a trunk of eighty feet without a branch, is dedicated to the Forestry Commission of Great Britain. One wonders what the ministers of Louis XIV would say if they could see that oak now.

The 225-year rotation of these oak forests is divided into three periods of between seventy and eighty years each. In the first period the natural oak seedlings are nurtured by thinning the thick undergrowth and by encouraging an under-storey of beech which helps the growing oak with food from its decaying leaves and suppresses the bramble nuisance. In the next period thinnings provide medium-sized oak for the market, and in the third stage, when the trees are from 150 to 200 years old, the process of gradually opening out the canopy begins, allowing oak seedlings to come up naturally and form a thick carpet of tiny trees to provide the forest for the next 225 years.

About fifty miles west of these magnificent oak forests and north-west of Alençon you

Deer-hunting flourishes in many parts of France and the state forests nearly all provide sport for followers from every walk in life. They use far more horns than the English are accustomed to

The European Silver Fir does not like an equable climate and flourishes only in conditions where extremes of heat and cold alternate. Near l'Aigle immoderate temperatures prevail and a forest of European Silver Fir is regenerated naturally

come to the upland plateau of Écouves, where conditions are quite different. Although the rainfall is the same, the soil-conditions are not. About fifteen miles north-west of Alençon there is a big geological fault which stretches right through to the coast: the chalk and Upper Jurassic are faulted against Palaeozoic rocks of Cambrian and Ordovician age. On the plateau west of this fault are oak forests existing in conditions very similar to those of the poorer uplands of Wales and the West of England.

In England only a very little really fertile land is devoted to forest, but in Normandy the existence of the old ducal hunting-forests preserved some of the best land for trees. The Forest of Écouves, on the other hand, shows what the French foresters can do with poorer land. I found that they had succeeded in converting considerable areas of scrub and poor oak coppice into some quite useful high forest, producing in some cases up to 4000 cubic feet per acre. They had done this by systematic selective thinnings of the coppice stools, preserving the straightest and healthiest stems.

During this part of my journey I spent the day with the forest-officers and at midday we would repair to some little village on the edge of the forest in which we would always find a restaurant able to serve an excellent meal. Such villages in England would have had no place at all for a meal, or at best a pub where you could get only bread and cheese and a glass of beer.

In all the villages there were flourishing small handicraft industries that depended on the small wood-thinnings from the forests. They included coopers making staves for barrels and carpenters making wooden agricultural implements, for French agriculture is not so mechanized as ours and wooden implements have not yet been replaced by metal machinery. But the invasion of the latter is beginning and no doubt in time the handicrafts will die out.

The chase flourishes in the French forests and in nearly every one some pack of hounds hunts the deer. Local hunts are organized by societies to which members from the local provincial towns and even from Paris subscribe, and many peasants come out on their horses.

I came across one interesting phenomenon when I was in the Orne Department near l'Aigle. I was shown a forest of European Silver Fir (*Abies pectinata*) which, as far as can be ascertained, has naturally regenerated itself from time immemorial. Nowhere else in the maritime climate of Normandy nor in the valley of the Loire does this species grow naturally. Other forests there are all planted. The European Silver Fir is known to flourish only in continental climates where the temperature is extreme. Its natural habitats are the Pyrenees and the Vosges. Near l'Aigle, however, the mean temperature in winter is lower than in the rest of Normandy and the mean summer temperature higher. A number of geologists, meteorologists and foresters in France today think that as the ice-cap retreated after the last glacial period, the European Silver Fir advanced northward, dying out where maritime conditions began to prevail and surviving only in pockets where the climate was locally more severe.

The most southerly point that I reached was the middle Loire basin in the country round Blois and Orléans. Here the climate begins to approach that of southern France and the Mediterranean. The rainfall is only 22 inches and the soil formation is Eocene with low lime-content. Beech is entirely absent but pure oak forest prevails under similar management to that obtaining further north, with rotations of up to 240 years. In this area perhaps the most interesting thing to see is a stand of Black Pine (*Pinus nigra*) at the forest nursery of Les Barres near Nogent-sur-Vernisson. A school for training foresters is established in the château formerly owned by Philippe de Vilmorin, who was a well-known sylviculturalist in his day. In 1820 he planted experimentally extensive areas of trees to test their capacities in the climate of the Loire basin. *Pinus nigra* has four varieties or sub-species (there are others of no economic value): the Austrian, Crimean, Corsican and Calabrian Pines. The experimental plots of six acres each of these four varieties of *Pinus nigra*, now just on 140 years old, show how they grow and what is the nature of their timber. It is a valuable experiment and the French Forestry Service has done good work in preserving what the genius of Philippe de Vilmorin originally thought out.

I do not profess to have seen more than a small part of the forests of France which extend eastwards to the Vosges, southwards to the maritime pine forests of Bordeaux and to the coast of the Mediterranean. But I was able to see how well organized they are and how self-supporting France is in much of her rural economy. Even if some other sections of her economy may find it difficult, owing to high costs of production, to withstand the cold blast coming from the rest of the world, this does not apply to her forest industry which has been efficiently managed for so many centuries.

The Bazaars of Kandahar

by CHARLES BEARDSLEY

Some of the author's impressions of life in Afghanistan have recently been published in book form by Peter Davies under the title of *The Naked Hills*

"The best way to show you the bazaars of Ahmad Shah", said Mehtabudin as we sat in a tea-house in Kandahar one morning last winter, "is to build you an imaginary house right here where Ahmad Shah was born, and furnish it with objects made in our bazaars."

Mehtabudin, my young student friend and guide, who was undertaking to show me the crafts of Kandahar, had been telling me something about Afghan history, particularly about Ahmad Shah the Great—poet, soldier, elder statesman—the first ruler of integrated Afghanistan, who created the original walled capital around an ancient core of mud huts in 1160 Hegira (A.D. 1748) and installed its first permanent craftsmen.

It was Juma—Friday (the Moslem Sunday). The bazaars teemed with shoppers: Nauzed hill shepherds in white wool-mat capes and thonged leather leggings; bright-turbaned, black-bearded town blades; a few women in sombre purdah; and the painted, belled *gharris* tinkling their way through the foot traffic.

We began our excursion at the town's edge, beyond the Shikarpur Gate. "Ahmad Shah set up the first brick and pottery kilns along the old caravan route to India to help build his city," explained Mehtabudin. As ornamented as temples, the kilns were scattered on the open road, which was already humming with potters fashioning household vessels of mud, camel's hair and cat-tails. Bricks were moulded in wooden frames, then set out to dry and later fired.

We stopped to watch weavers plait coarse panniers from saplings and smaller household baskets from soft rattan. "These are for your domestic needs," said Mehtabudin, "or baskets for your caravans taking grapes and pomegranates to India, or Shindan desert salt to Kabul. Oh yes, and your camels . . ."

We moved to a camel-mart outside the old walls that Ahmad Shah had built, where regular Juma auctions were in session. "Dromedaries," said Mehtabudin, pointing to some ill-tempered beasts. "In the north it would be the hairy Bactrian—he withstands extreme cold. A healthy animal that does the work of two horses and is good for twenty years' service would cost about £20."

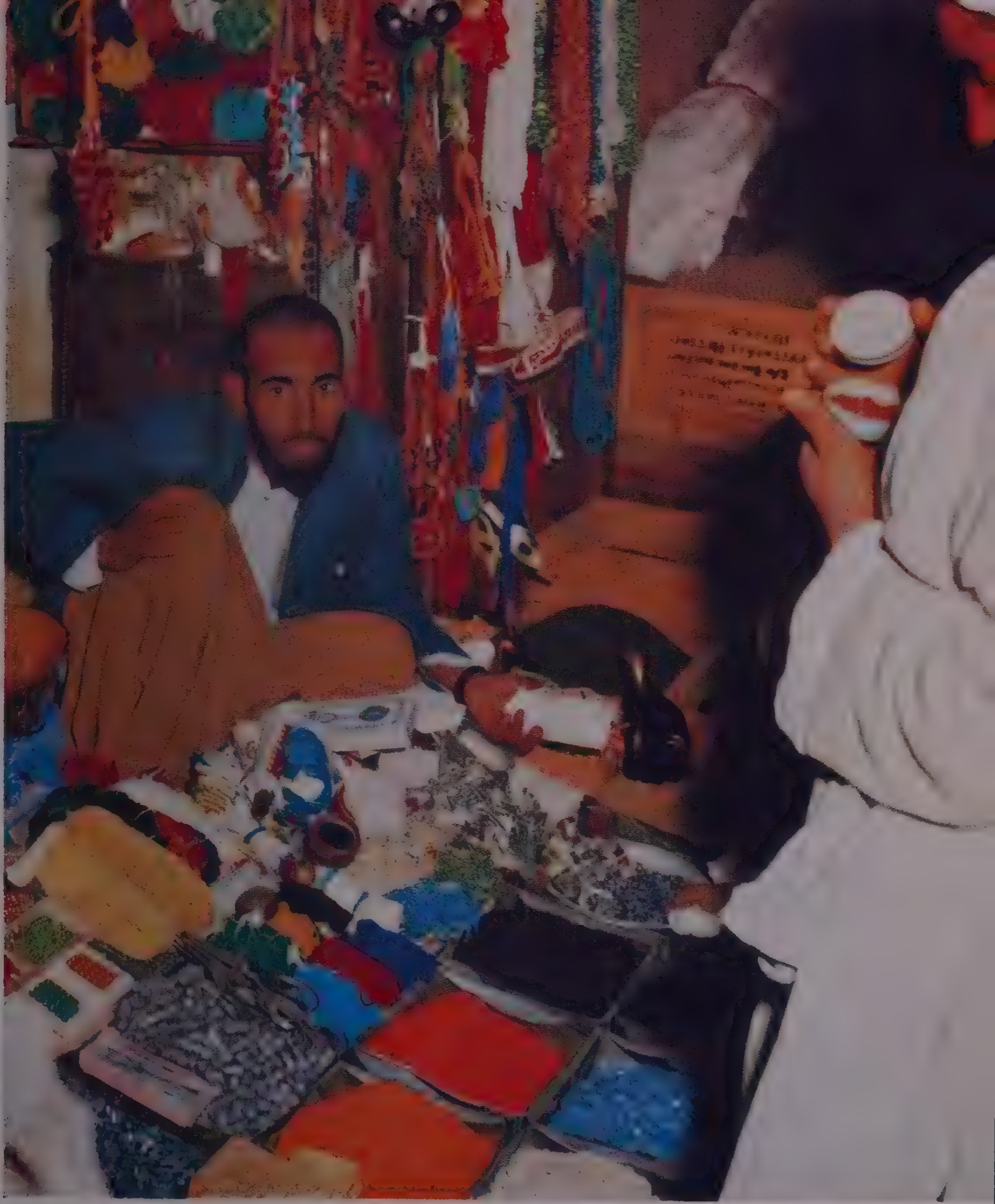
We drove into town to a rug merchant's. "Carpets for your brick house," said Mehtabudin. I admired most the Maur-i patterned carpets with their unmistakable central elephant's-foot design from yellows and buffs to reds and oranges, flecked with dark and light blue fields. "The most typical Afghan carpet," said Mehtabudin approvingly. "Ahmad Shah said it held the colours of Afghanistan: ruby sunsets, flowers, deserts, summer and winter skies—and the elephant's foot to remind us that we conquered India."

We visited furniture bazaars. Carpenters were making rough-hewn *charpoys*, bedframes with heavy rattan 'springs'; low chairs, hardwood tables, wardrobes. We moved down the thronged street of mud-brick façades. "Now something for the wife who will live in your house," Mehtabudin suggested. We stopped to watch boy apprentices fashion rough chunks of Afghan jade into beads. The chartreuse-coloured opaque stone is chipped into small squares, clamped in a lathe, turned with a bowstring and shaped by a sharp chisel. "Prayer strings," Mehtabudin explained, "which are highly prized by *mullahs*, our holy men. Often these beads turn up for sale in the bazaars of Mecca."

We visited karakul shops next to a mosque with stubby minarets in Shah Bazaar. Karakul—lamb-skin—is Afghanistan's major industry; it exports the world's finest pelts, some 15,000,000 a year. For local sale, skins ranging from traditional black to rare and expensive golden brown are cut by skilled furriers into the famous Kabul design: a trench cap four inches high at the front peak, tapering down to two-and-a-half inches at the back.

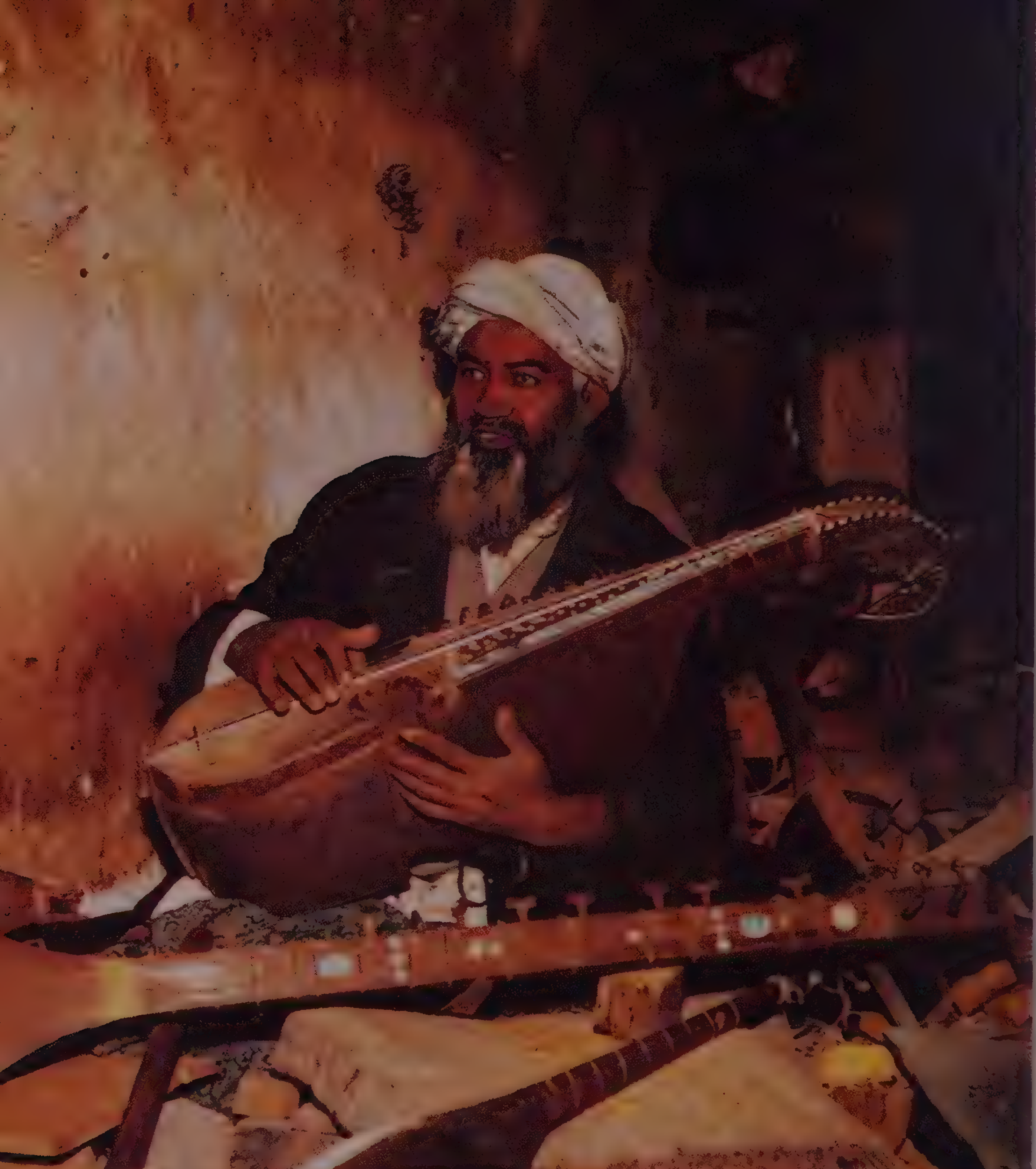
"You'll need a black, a grey and a golden brown," advised Mehtabudin, "with the tightest possible curl. The golden was Ahmad Shah's favourite; today it's worn by rich men and presented by His Majesty Mohammed Zahir Shah to distinguished foreign visitors: Khrushchev, Chou En-Lai, Eisenhower. . ."

After this we visited haberdashery and spice bazaars, metal-smiths, the *tamboor* maker, the blanket market, then took a pony



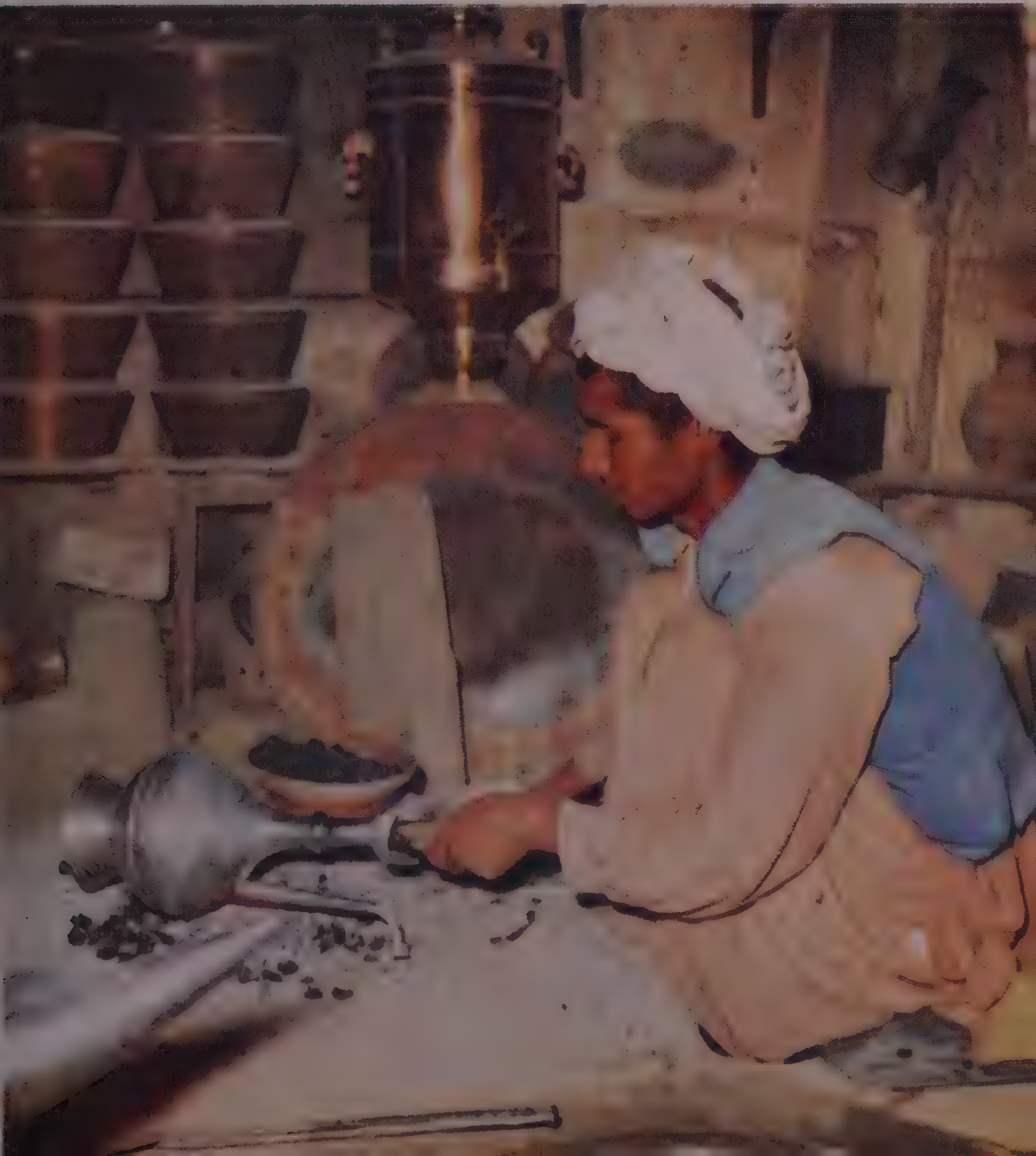
All Ektachromes by Charles Beards

A Kandahar merchant doing business in a typical miniature department store. Ground spices, a staple of most bazaars, are prominently displayed in the foreground, among them henna, saffron and morchak *(paprika), which is dusted on fried fish. Various sorts of haberdashery hang from the walls; others are laid out at the merchant's feet. The customer is examining a traditional circular snuff-box with a mirror set in its lid*



Kandahar's master tamboor *maker displays one of his finest instruments, a* rhabob *inlaid with mother-of-pearl. It has twenty strings, and is less flexible and harder to play than the seventeen-stringed tamboor lying in front of it, which is the most popular classical instrument of Afghanistan. The craftsman shown here is an accomplished musician, able to play with skill any of the instruments he makes. Like all tamboor makers, he learned his trade as a child-apprentice*

This coppersmith, who is plating a water-vessel with tin over an underground forge, still uses the techniques developed by his forefathers, who were brought from Persia in the 18th century by the first ruler of Afghanistan, Ahmad Shah the Great. The metal-smiths of Kandahar still speak pure Farsi. They are of the Shiah sect of Mohammedans and live apart from the Sunni sect, to which most Afghans belong



A cash transaction between Indian cloth merchants. Indians dominate the bazaars' wholesale textile trade, importing materials from England, the Continent and Asia. They have preserved their Hindu beliefs and customs and are looked down upon because of their polytheism, though they are frequently wealthy. They do not intermarry with Afghans, and often go to India to find a bride. Their women do not observe purdah gharri to the Baba Wali grist mill at the town's northern edge, the oldest mill in Tarnak Valley. "Ahmad Shah's new city was supplied with its first flour from this mill," Mehtabudin explained, "and the people still like the stone-ground flour from it better than any other. They'd rather wear their teeth flat from chewing powdered rock than taste electrically milled flour, which has a burnt flavour." Baba Wali's ponderous mill-stone is driven by water and grinds about 150 pounds of flour an hour, day and night.

We passed naturally from the mill to the town flour market. In an open-air courtyard merchants bartered with housewives in dark flowing *burqhas*, the shroud-like head-to-foot purdah garments with crocheted slit over the face, which make all women invisible to the public. The quality of the flour was tested by hand-rolling it into tiny paste-cakes. Next to the flour market we walked down a line of pastry shops; local snowshoe-shaped bread (*nan*) of pancake thinness was being baked.

"Unleavened nan is the staple diet all the year round in Kandahar," Mehtabudin said as we crowded into a small bakery to watch flour-dusty bakers knead dough into flat ovals, spread them onto wooden paddles, slap them down into a glowing subterranean oven to bake against hot brick walls. As the baked nan started to fall away it was deftly removed by paddle and stacked to cool in huge piles.

Then came the covered bazaars of shoemakers and tailors. "The typical Afghan shoe is a gold or silver-brocaded slipper with an upturned toe called a *mochan*. It originated in the Punjab, but Ahmad Shah imported it with the shoemakers." In adjacent shops, tailors were sewing brocaded *sadris*, short sleeveless Afghan vests of silk and velvet, some heavy with gold and brilliants.

Mehtabudin led me to a shop that made *camisses*, the long Afghan knee-length shirt with flowing sleeves and embroidered chest-panel, and the *partouks*, or trousers, cut from six yards of material gathered at the waist on a drawstring, draping down to the ankles. "At last you are properly dressed for your new house," Mehtabudin said, guiding me away from the bazaars toward Kandahar's central square of municipal buildings. "And now," he added in a more serious tone, "it is time you were prepared spiritually for your residence."

We crossed the dusty square to Kharqa Sharif, holiest Afghan mosque. Leaving our shoes at the marble entrance, we stepped over the door sill, right foot first, and stood on rich carpets before the silver shrine. On lacquered lecterns ancient illuminated Korans lay open, partly covered by embroidered silken cloths.

"Behind the Holy Dalan", Mehtabudin whispered, "lie the remnants of a cloak that belonged to Mohammed, one he gave to pious Bokharan converts and which Ahmad Shah brought by peaceful strategy to Afghanistan when Kandahar was finished—to sanctify this mosque especially built for it." Only royalty and chosen attendants can touch the relic, he explained. "Many decades ago a plague threatened Kandahar. The cloak was brought from its silver casket, donned by the Shah and paraded through the streets. Old mullahs claim that this act averted disaster and stopped the plague at the city's gates."

Leaving behind the hushed interior we paused by the central ablution pool in the garden courtyard. I saw a line of cubicles against a far wall. "Cells for fugitives who take sanctuary here," said Mehtabudin. "Murderers, embezzlers, adulterers—all are admitted. They're safe here for ever, but if they leave . . ." He pointed to armed soldiers patrolling the main gate.

Through a side archway we left the quiet garden of Kharqa Sharif and entered the vast promenade before Ahmad Shah's tomb. With its magnificent dome and classic Moghul lines, it is Kandahar's most impressive edifice. Its vaulted ninety-foot-high chamber was as finely wrought as a Kashmir box: walls, soaring dome, even window recesses, were painted with myriad arabesques in gold, brown, Chinese red, peacock blue, smoky green. Silent pilgrims stood reverently beside Ahmad Shah's covered cenotaph.

Mehtabudin indicated an upper moulding, a white strip with intricate black epitaphs in Farsi and Pushto, praising Ahmad Shah. We examined a glass case in which lay a carved silver casque and chain-mail armour, worn by Ahmad Shah when he conquered the region between Isfahan and Delhi.

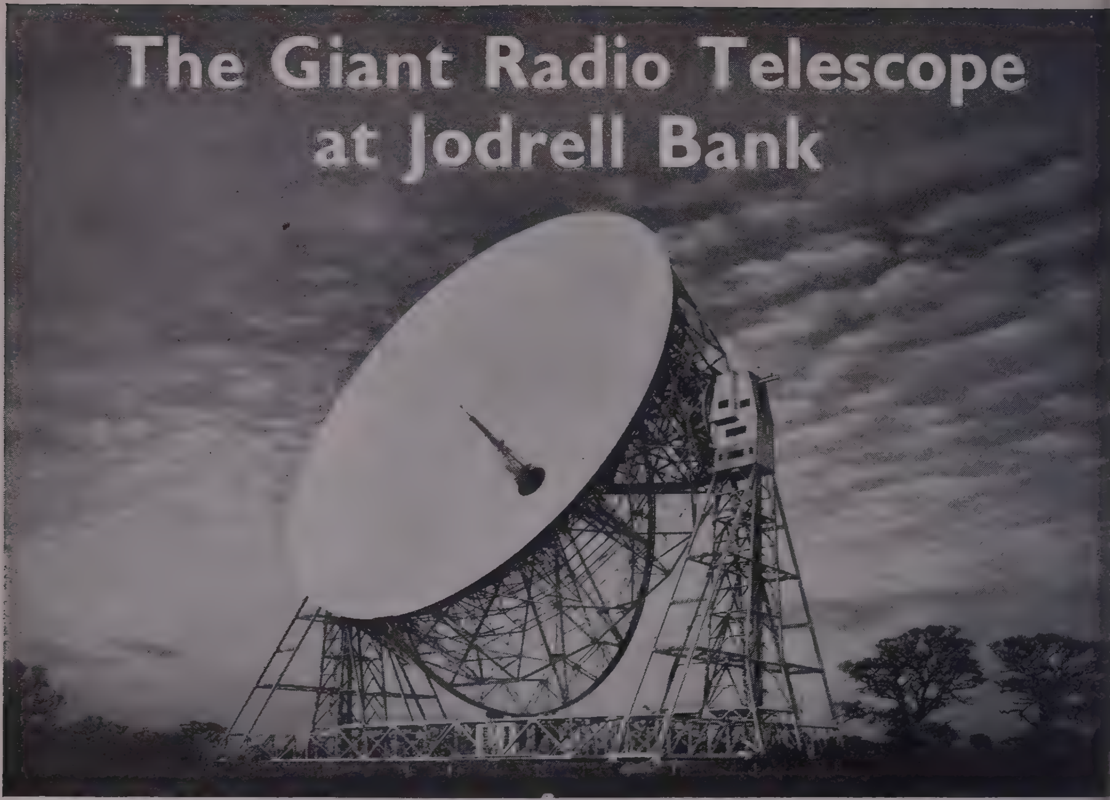
"'By the help of Allah, my victory is near'," Mehtabudin read from the inscription. "And it was," he added. "Our warring tribes became a peaceful nation, and Ahmad Shah's capital of Kandahar, the 'sweet place', became a living monument—a city of bazaars, shrines and learning. And some of each is left . . ."

We came out into the clear winter sunshine—the creamy brown city before us, the vivid Torkani hills behind.

"Now", said Mehtabudin with a smile, "you are a true Kandahari, a citizen of my city."

I could hardly deny his statement, having seen it through his eyes.

The Giant Radio Telescope at Jodrell Bank



All photographs, except one, C.O.I., Crown copyright

by Dr R. D. DAVIES

Lecturer in Physics at Manchester University and on the staff of the Jodrell Bank Experimental Station

TODAY the giant radio telescope at Jodrell Bank in Cheshire is known in all the countries of the world for its part in tracking the first Russian and American earth satellites and for its investigations of the radio universe. This article sets out to tell how the radio astronomer's dream became a reality in steel.

Six years ago when I joined the staff at Jodrell Bank the foundations had recently been laid. In a muddy, waterlogged field in Cheshire was sunk a gigantic circular slab of concrete which was supported on concrete stilts reaching down through clay and sand to solid rock ninety feet below. This layer of clay and sand was deposited 20,000 years ago in a glacial lake trapped between the Pennines and a receding glacier which had its origins in the Irish Sea. While the ninety feet of deposits were being laid down radio waves from the centre of the Milky Way system were setting out on their journey to the Earth at 186,000 miles per second and are only now arriving at the giant radio telescope.

A radio astronomy project was begun at Jodrell Bank soon after the war, in 1946. It was directed by Dr A. C. B. Lovell (now Professor Lovell, F.R.S.) and formed a new research group within the Physics Department of Manchester University. Dr Lovell had previously led a team at the Telecommunications Research Establishment at Malvern which had developed H_2S ("Home Sweet Home"), the radar navigation instrument, which made Bomber Command's blistering offensive in Europe in 1943-4 so effective.

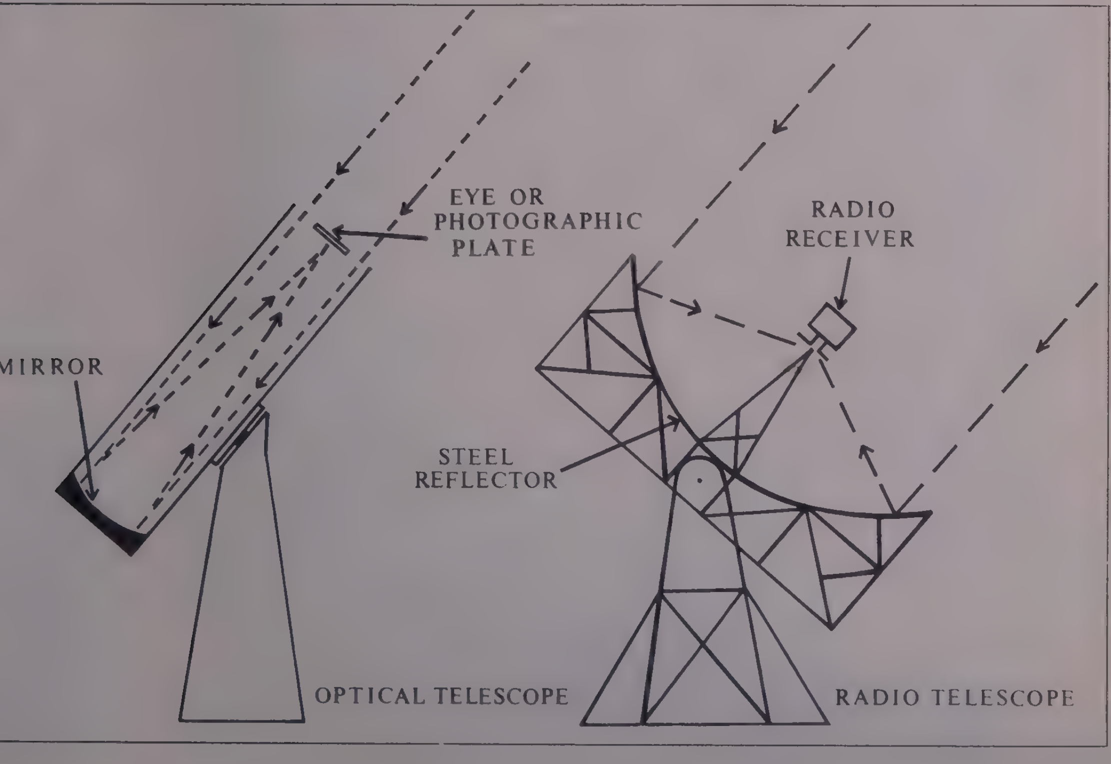
During the war a number of radio astronomical discoveries using radar were made which suggested an exciting peacetime programme. It was to follow up these that Dr Lovell and his colleagues brought a quantity of ex-service radar transmitters and receivers out to the gardens of the Botany Department at Jodrell Bank well away from the radio interference generated in Manchester's industrial sites. The transmitters were used to discover streams of meteors or shooting stars which plunge into the Earth's upper atmosphere during the daytime and are invisible to optical astronomers. A pulse of radio waves sent out from the transmitter was reflected back to Earth by the hot trails left behind by the meteors. Faint echoes were also received back from the Moon 240,000 miles away. In other experiments radio waves generated far out in space by unknown processes were received as very weak signals on the existing radio telescopes.

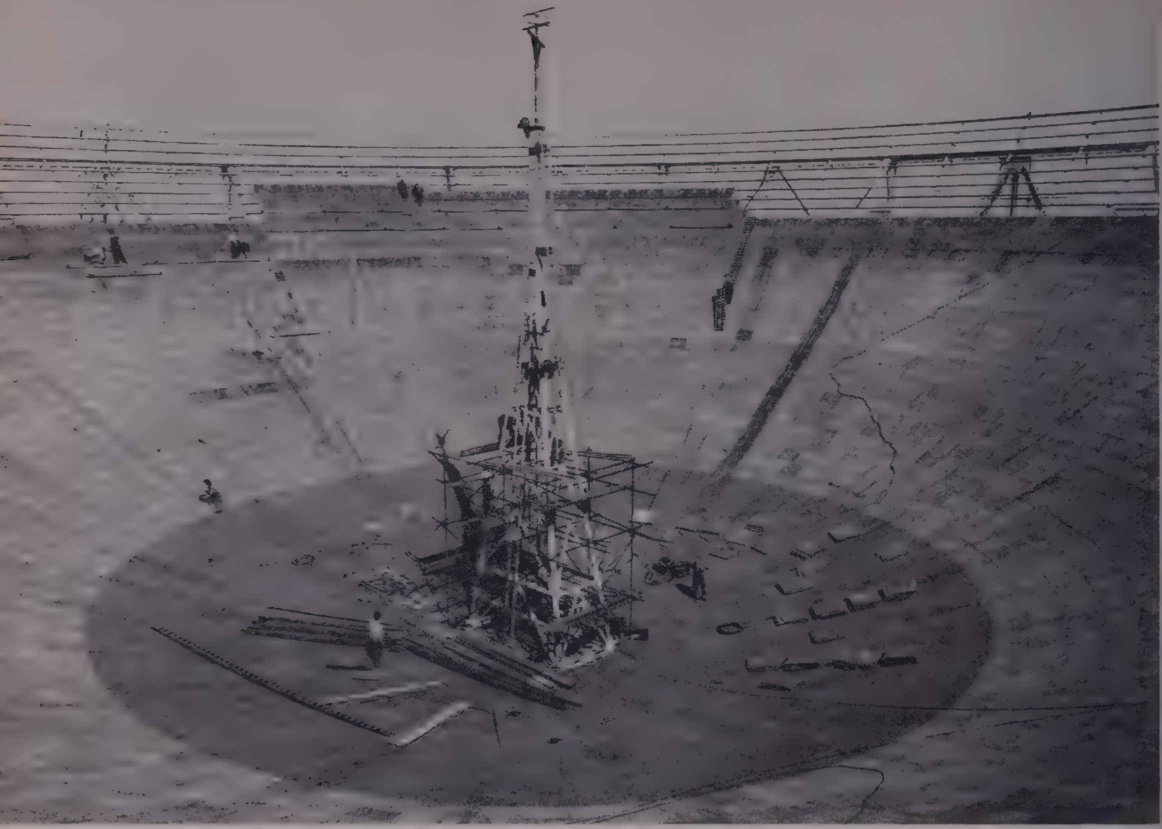
During this early period of discovery at Jodrell Bank and at other radio astronomy stations throughout the world there grew in Dr Lovell's mind the idea of a large steerable radio telescope more than 200 feet across. It could be directed at any part of the sky and made to follow or scan any desired radio star; it could collect radio waves from the faintest and most distant radio objects; it could distinguish fine detail in the radio sky.

The realization of this dream took some eight years, from 1949 to 1957. Since the aim of the research was essentially academic the problem of financing such a large project within a university had to be solved. On the other hand the engineering feat demanded by Dr Lovell was also a tremendous challenge. Thought had to be given to the design and construction of a 2000-ton instrument—an instrument that had to be accurate within inches, preserving its shape in all positions, all wind-loadings and all weathers. Messrs Husband and Company of Sheffield and London accepted the challenge and the new engineering problems it raised.

The effect of wind posed a major problem, and accordingly the preliminary engineering studies included a wind-tunnel test of a scale model of the radio telescope. This showed the desirability of constructing a stabilizing girder under the reflecting bowl. This structure, which looked rather like half a giant bicycle-wheel, was incorporated to prevent resonant vibrations. Such vibrations may be seen and heard in outdoor telephone wires on a moderately windy day. They can assume large proportions in a tall structure and were responsible for the collapse of the Tacoma suspension bridge in Washington State during 1940. Gusts with peaks up to 90 m.p.h. have once been recorded at Jodrell Bank.

An optical reflecting telescope receives light waves and a radio telescope radio waves, but they work on the same principle: in both, reflecting surfaces redirect the waves to the focus where they are intercepted, the one with a photographic plate, the other with an aerial and radio receiver





The reflecting bowl of the Jodrell Bank radio telescope. It is 250 feet across—about as big as Piccadilly Circus. This photograph, taken at the beginning of 1957, shows the completed tower that supports the aerial and the last of the 10,000 steel plates being welded into position

The principle upon which this radio telescope operates is the same as that used in the world's largest optical telescopes. This is not surprising since light and radio waves are of the same nature, both being electromagnetic waves. Both types of telescope have parabolic reflectors which collect the waves and bring them to the focus where they can be examined (see diagram on page 451). In the optical telescope the eye or a photographic plate may be placed at the focus, whereas in the radio telescope a small aerial is situated at the focus. It is at this point that the radio astronomer begins when constructing his receiver to investigate the extra-terrestrial radio waves. The engineering programme on the other hand is concerned with building the reflector, and indeed the casual visitor to the radio telescope can almost be forgiven for not seeing the aerial which eventually absorbs the radio waves and passes them on to the receiver.

The reflector is 250 feet in diameter and is held in shape by a 700-ton cradle of steelwork. The surface is a skin of steel approximately one-eighth of an inch thick; it happens to be painted with a white matt finish although this is not important for reflecting radio waves. The required smoothness of any telescope reflector is about one-tenth of the wavelength used, so in the radio domain this may work out to one inch, while at visual wavelengths it is one-millionth of an inch, which amounts to a high polish.

The huge reflector is supported on each side by two towers in each of which are housed two 50-horsepower motors which tilt the bowl up and down, or in elevation as it is called. These motors deliver their power onto 25-foot-diameter toothed racks fixed to the reflector structure. The racks were originally gun-turret mounts on the battleship H.M.S. *Royal Sovereign.* The reflector is sometimes completely inverted so that it looks like an enormous umbrella; in this position any heavy or complex radio equipment can be lowered to the ground from the focus.

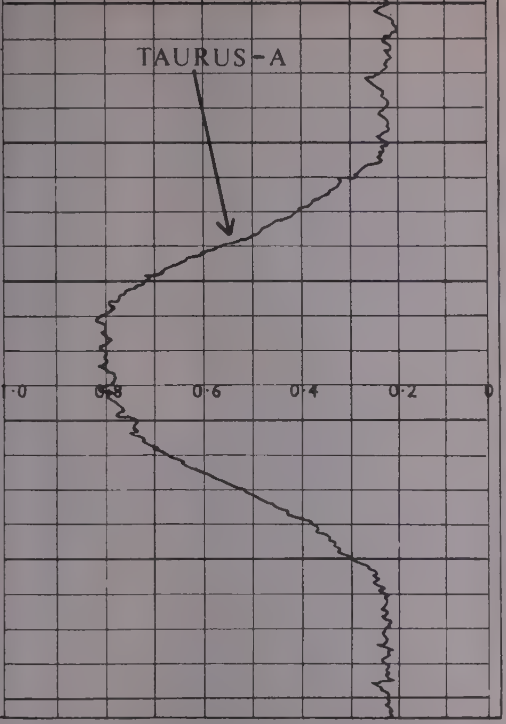
The supporting towers form a part of a yoke which moves on a circular railway track 300 feet in diameter and fixed to the concrete foundations. Movement around the railway track is provided by four 50-horsepower motors which turn the telescope in azimuth, that is, in a horizontal circle, through the points of a compass. The reflecting bowl can be directed towards any point in the sky by a suitable combination of movements in elevation and azimuth. The 2000-ton mass of steelwork is so well balanced that on a calm day the power necessary to move it is less than one horsepower, about what is needed to drive a small lawnmower.

When the radio telescope is directed at a radio source, for example the Sun, some of the radio waves emitted from the Sun into space in all directions will fall upon the reflector and be brought to the focus. The frequency or "radio colour" of the waves being collected is regulated by placing an H-aerial of appropriate length at the focus. The radio waves thus collected and amplified cannot be sensed by man's faculties and have to be converted into a visual trace. The strength of the radio signals received from the Sun can be displayed as a deflection on a moving chart, the deflection being proportional to the strength of the radio signals. Such a trace of the Sun's activity will not only show slow changes from day to day but also abrupt excursions at times of gigantic eruptions on the Sun's surface.

A separate function of the radio telescope is its use as a radar instrument when pulses of radio waves are transmitted from the focal aerial and are reflected from the bowl of the telescope into a narrow cone directed, for example, towards the Moon. Just over one second later these waves strike the Moon and some are reflected back towards the Earth where a minute fraction of the transmitted radio energy is received two-and-a-half seconds after. The time delay between the transmitted and received signal gives directly the distance of the reflecting object since the speed of radio waves is known. For the planet Venus, the Evening and Morning Star, the time delay at its nearest approach is four minutes. Very weak echoes have already been received from Venus using the Jodrell Bank radio telescope as a radar instrument.

The versatility of the radio telescope and indeed its political importance were drama-

The telescope can be moved through the points of the compass on a double circular railway, 300 feet in diameter. The driving bogey (right) turns the telescope and is powered by a 50-horsepower electric motor. The wind carriages (centre and left) give the telescope stability in high winds



By courtesy of the Royal Astronomical Society

(Opposite) *The Controller can direct the 2000-ton radio telescope towards any part of the sky from his desk in the control room at Jodrell Bank. Radio waves received from an extra-terrestrial source are amplified and converted* (below) *into a visual form, generally a trace on a moving chart of the strength of the radio emissions.* (Above, left) *A trace (redrawn to make it clearer) obtained when the telescope was scanned across* (above, right) *the Crab Nebula, a star which exploded in A.D. 1054*

tically brought to the attention of the world before the finishing touches had been added to the paintwork and the superstructure. Up to this time only preliminary tests had been made of the radio properties of the reflector although they were enough to demonstrate that the engineering project was successful. On October 4, 1957, Sputnik I, the first earth satellite of the International Geophysical Year series, was launched by the Russians.

The station's normal research activities were halted by the surprise announcement of the launching and within hours the telescope was turned to intercept the radio signals being sent out by a miniature transmitter housed in Sputnik I. Moreover, a few days later radio waves were transmitted from the telescope and echoes were obtained from the larger body of the last stage of the launching rocket. After the transmitter on Sputnik I failed, the rocket body was tracked by radar using the Jodrell Bank radio telescope, as this was the only instrument in the world capable of getting echoes. This became most exciting as the rocket body spiralled lower and lower into the Earth's atmosphere. The rate at which a satellite's height decreases depends upon drag of the air at that height and gives a measure of the density of the air. In this way the density of air at 100 miles and above was found to be twice that previously estimated.

This satellite was followed by American and more Russian space vehicles which relayed to Earth information about the newly discovered radiation belts and the conditions in interplanetary space. The Jodrell Bank team played an important part in locating these satellites in their first orbits and "commanding" some of them to transmit collected data back to Earth.

The major work of the radio telescope is unravelling the secrets of the radio emissions from distant parts of space far beyond the Sun's planetary system. Dotted throughout the radio sky are many bright objects called radio sources which are in no way associated with optical stars. Indeed only by careful study of optical photographs have a number of these sources been identified with visual objects. Several were found to be the twisted remnants of exploded stars in the Milky Way; others were the result of collisions on a fantastic scale of distant galaxies of stars. For example, the second brightest radio source, called Cygnus-A, is the collision or interaction of two galaxies so distant that light and radio waves from it take 600,000,000 years to reach the Earth.

A question which exercises the minds of many radio astronomers is whether the large fraction of the radio sources which are not yet identified might not be similar to Cygnus-A. If they are, then some of the fainter ones might be ten times further away than Cygnus-A and would be near the observable edge of the Universe. It is felt that if these sources have the same brightness, area for area, then they are likely to belong to the Cygnus-A class of object. This can be measured by determining the angular size of the fainter sources; that is, the measurement in degrees, minutes or seconds of arc of their diameter as recorded on Earth. Since the radio telescope can only discern detail of about one degree, special techniques have been devised to investigate detail of a minute of arc or less. This can be achieved by combining the radio signals received by the 250-foot radio telescope and by another aerial situated perhaps ten miles away. Using this technique many radio sources less than ten seconds of arc in diameter have been discovered, and it would appear that many are like Cygnus-A.

The exciting possibility is that a continued investigation of these radio sources at great distances will lead to a test of various cosmologies, or pictures of the Universe. Since the radio waves set out from these sources thousands of millions of years ago, they represent conditions in the expanding Universe at that early time when the sources were much younger and may be compared with conditions in nearby radio sources. One theory, the Evolutionary Theory, says that the more distant sources would be closer together since they are representatives of an early stage in the expansion of the Universe. Another, the Steady State Theory, predicts that the population of space looks the same at all times and therefore the distant radio sources would be dispersed throughout space with the same density as the nearby galaxies. Thus an observational study of the density of radio sources will show which of the theories is correct.

Britain has therefore a primary role in the exploration of space using the 250-foot reflector at Jodrell Bank. Other telescopes of similar size are in the course of construction in Australia and the U.S.A. but will not be in full operation for several years. The possession of the world's largest steerable radio telescope gives us an unparalleled opportunity of making major contributions to the understanding of the radio universe. Moreover, it has a unique part to play in locating and "commanding" the satellite and deep-space probes scheduled for the next few years.

A Stretch of the Shannon

by M. DUFFY

THEY hadn't had such a request before nor were they taking any chances in granting it, I thought when the Irish Transport Board (Córas Iompair Éireann) replied to a letter in which I had asked for permission to travel as a passenger on one of their River Shannon barges. For their reply said that in the ordinary way they didn't carry passengers on these craft; but in view of the circumstances I had outlined they would be prepared to grant permission, subject to the completion of the enclosed Letter of Indemnity. This set out a number of clauses, had to be witnessed and signed over a sixpenny stamp, and left no grounds whatsoever for suing them for damages as a result of any accident, major or minor, which I might meet on my projected journey.

Briefly, the "circumstances outlined" were that I was of Irish descent, a trade journalist by occupation, kept a motor-launch on the Thames as a hobby and was anxious to glean first-hand information about boating conditions on the Shannon. So I had supposed, rightly or wrongly, that a good way to acquire such information would be to travel on the Shannon in the company of people who had been going up and down it for years to earn their livings. I thought, also, that to see a country from a river would be an original approach and that a barge-crew would be useful, if unorthodox, guides.

A map had previously told me that the Shannon is the longest river in these islands, just beating the Severn and the Thames. I learned, too, that it has nine lakes and eleven tributaries along its 220 miles of navigable length, and that it drains an area of some 4500 square miles, which is about one-sixth of the entire Republic of Ireland. Official sources had shown that the Thames has a total of about 6500 barges and nearly 400

By courtesy of the Irish Tourist Boar

(Left) *The Shannon Pot, in Co. Cavan up on the Ulster border, is the source of the River Shannon, the longest river in the British Isles.* (Below) *One of the Shannon barges which carry cargoes—including Guinness porter—from Dublin, by way of the Grand Canal, to Limerick*

By courtesy of Arthur Guinness Son & Co. (Park Royal) Ltd

tugs: I learned that the Shannon has only about a dozen barges and no tugs.

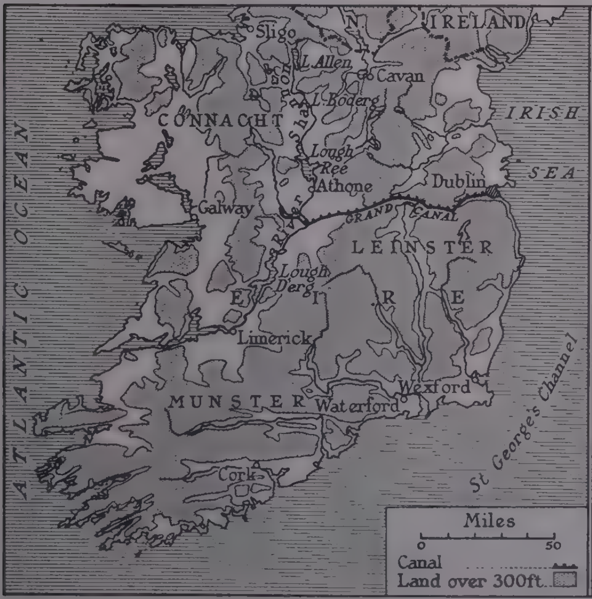
I went aboard the Shannon barge near Banagher, in the mid-Shannon area. The steel craft was a little over 100 feet long by about twelve feet in beam, like its counterpart on the Thames, and was powered by a Bolinder diesel engine. Both engine and cabin-space for the crew of three, skipper, engineer and deckhand, were well below the gunwales, the only protuberance above being the closed-in wheelhouse aft of midships.

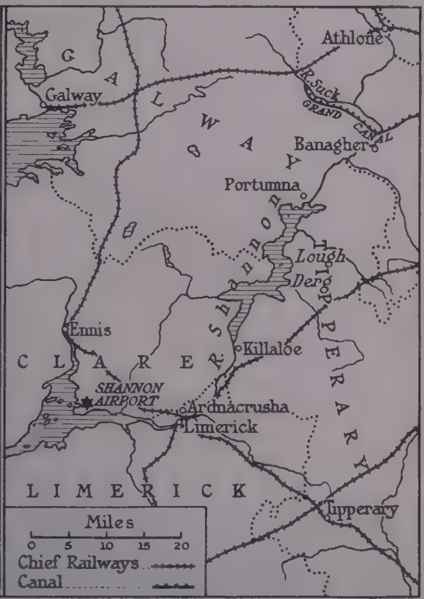
Barrels of draught porter from Guinness's brewery in Dublin, which had been brought across Ireland on one of the canals linking the Shannon to the capital, made up the cargo. It was destined for the city of Limerick, just over fifty miles below Banagher, at the upper end of the tidal estuary of the Shannon. Porter is a treacle-black stout with a creamy head and a rich, nutty flavour. An English visitor once said that "it sort of slides down". In Victorian times it was a popular drink in England: nowadays, however, it is practically unknown there. But in Ireland, where a number of Victorian traditions still linger, the drinking of draught porter, which is one of them, shows no signs whatever of being abandoned.

The six-mile stretch of the Shannon from Banagher to Portumna is interrupted by one lock, at Meelick. The surrounding countryside is flat but has a quality of spaciousness since the horizon, on all sides, appears unusually remote. Both banks of the river are girdled with rushes, willows and patches of water-lilies, with every here and there a darting dragonfly; one sees an occasional farm or house. The deep throbbing of the diesel engine, transmitting its vibrations to the steel deck of the barge, and the soft lapping of the water, faintly brown-tinged because of the peaty nature of the soil, were the only sounds in that far-flung dome of Nature's silence.

I learned of council houses lately built in the district let for a weekly rent of four shillings and sixpence, of Shannon bargees on sailing craft in Victorian times earning a weekly wage of ten shillings, this rising by annual increments of sixpence to a maximum of twenty-four shillings or so, and of families of around ten children reared on such a wage who went barefoot but never hungry.

Portumna, lying at the northern tip of Lough Derg, was soon reached. The town's main feature is Portumna Castle. Once the seat of the Clanricarde family, the largest landowners in Ireland, it is now the property of the Earl of Harewood. No trace remains of the original mediaeval fortress of Norman times, and the great 17th-century house of the Clanricardes which the present Portumna Castle succeeded was accidentally burnt down about the time of Waterloo. Close beside it stand the ruins of a 13th-century Cistercian abbey: the ivy-covered east window of this ruin is known for its beautiful tracery. The town is also remembered for having been the birthplace of the record-breaking motorist





A. J. Thornton

Sir Henry Segrave.

One of the few bridges over the Shannon is at Portumna, a span of which is swung open for the passage of craft. We passed through this swing-bridge and very soon the broad expanse of Lough Derg began to open out ahead. Largest of the Shannon lakes, it measures twenty-two miles by ten.

On this sunny, windless and cloudless day the glinting surface of the lake was completely smooth. With not another craft in sight the Shannon's peculiar quality of lonely spaciousness seemed even more pronounced, dwarfing us with its placid majesty. More and more of Lough Derg's wooded islands and islets, bays and points moved into view, and surrounding hills and valleys, forests and smiling fields stretched away to misty invisibility. They had all, I thought, more than their natural share of the rich, unspoiled green that is Ireland's very own. As the barge throbbed further and further on, alone into the deeper and wider loneliness of the lake, the only blemishes on the glass-like surface were the rippling bow-wave nosed up forward and the rapidly expanding and lengthening angle of the trailing wake behind.

We almost seemed a desecration there.

During the five-hour passage down the length of Lough Derg, however, I learned how all the Shannon lakes are sometimes the centres of violent storms, that the very craft on which I was travelling had herself been buffeted by twenty-foot-high waves which rolled over her from stem to stern. The reason for the closed-in wheelhouse was now evident.

As time passed I caught an occasional glimpse of giant leaping trout and of hovering cormorants which every now and then made lightning, plummet-line dives into the lake for fish. Single houses began to appear, those right on the shores mostly with their own neat little harbours. My guides gave me details of

(Opposite) *Lough Derg, one of the three big lakes which the Shannon traverses on its journey.* (Below) *An inlet at Whitegate on the Co. Clare side of Lough Derg. The lake and the Shannon generally afford excellent facilities for boating in various forms, as well as for water-skiing*

By courtesy of the Irish Tourist Boar

their present and previous occupants, and of some in Edwardian and even Victorian times.

I learned that a century or so ago the Shannon had been the main transport artery of the country for both goods and passengers, that these remained considerable until the advent of the railways. During this time stately J-class yachts with crews of paid hands, as well as a regular service of paddle steamers on which high teas were served for 1s. 6d. by waitresses in caps and aprons, were also an established part of the Shannon background. The railways, however, and later the rise of road transport, slowly but surely drew off both goods and passenger traffic and emptied the paddle steamers, whilst the economic effects of two world wars thinned out the sailing yachts.

This account of recent history was succeeded by stories of a much earlier time as the island of Iniscealtra moved into view on the starboard side. Forty-nine acres in extent, it has a ruined church, a graveyard with memorial stones inscribed with Greek, Celtic and Latin crosses, and a good specimen of that distinctive item of Irish architecture, the Round Tower. Scores of these Round Towers are scattered all over the country. They vary in size from 60 to 150 feet in height and 40 to 60 feet in base circumference. Much controversy has centred round them and theories of their Phoenician, Druidical and Danish origin have from time to time been put forward. The general trend of modern opinion, however, is that they are Christian ecclesiastical buildings of about the 5th century. Their function, it is held, was to act as places of strength in which sacred utensils, books, relics and other valuables could be deposited and to which the churchmen to whom they belonged could retire for security in the event of attack. For several centuries Iniscealtra was a seat of sanctity

rtesy of the Inland Waterways Association of Ireland

y courtesy of the Irish Tourist Board

(Opposite) *Approaching Killaloe, at the southern end of Lough Derg.* (Above) *The old bridge at Killaloe.* (Right) *The air-crews from Shannon Airport like to spice their off-time with the excitements of water-skiing*

By courtesy of the Shannon Free Airport Development Authority

ll three photographs by J. Allan Cash

(Above, below and opposite) *Limerick, at the head of the Shannon estuary, is a seaport and manufacturing town as well as being a place of great historical and architectural interest. King John's Castle is Norman, and many of the city's streets are lined with dignified brick houses of the 18th century*

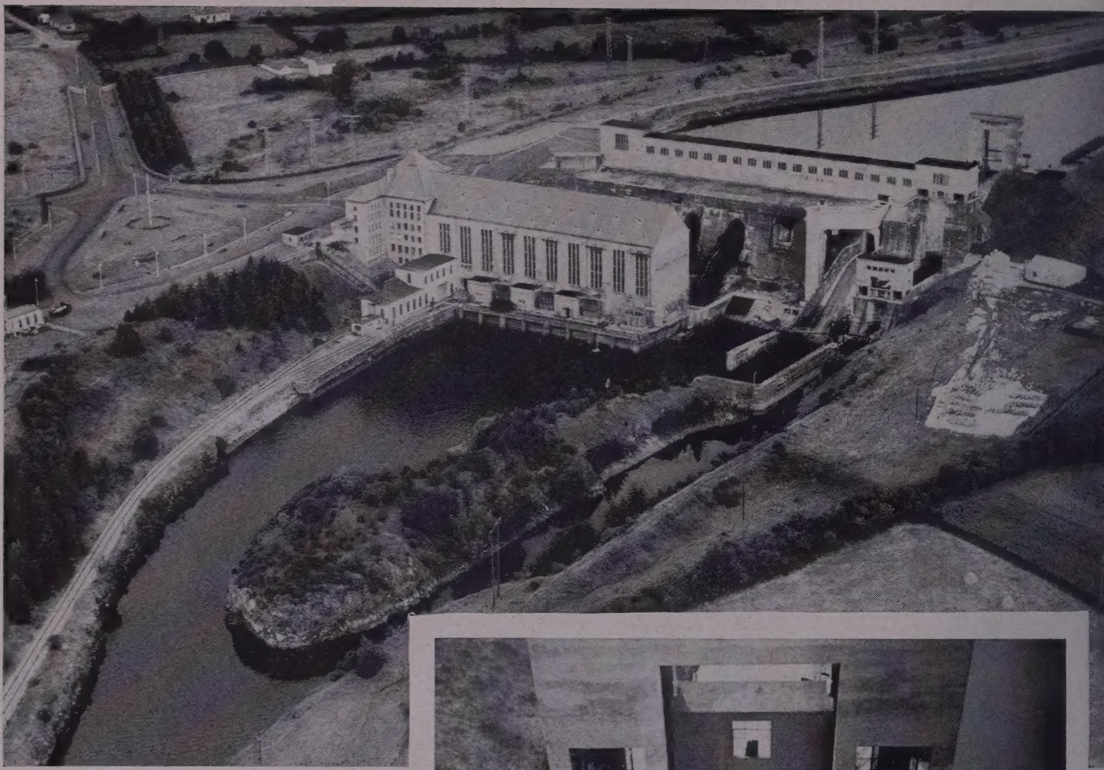
and learning and attracted scholars from all over Europe; but it suffered too a number of raids from native marauders and from Viking invaders.

The island and its Round Tower now faded from sight, and Lough Derg narrowed from its ten-mile width near Iniscealtra to the long channel, just over a mile wide, leading to Killaloe at the southernmost point of the lake.

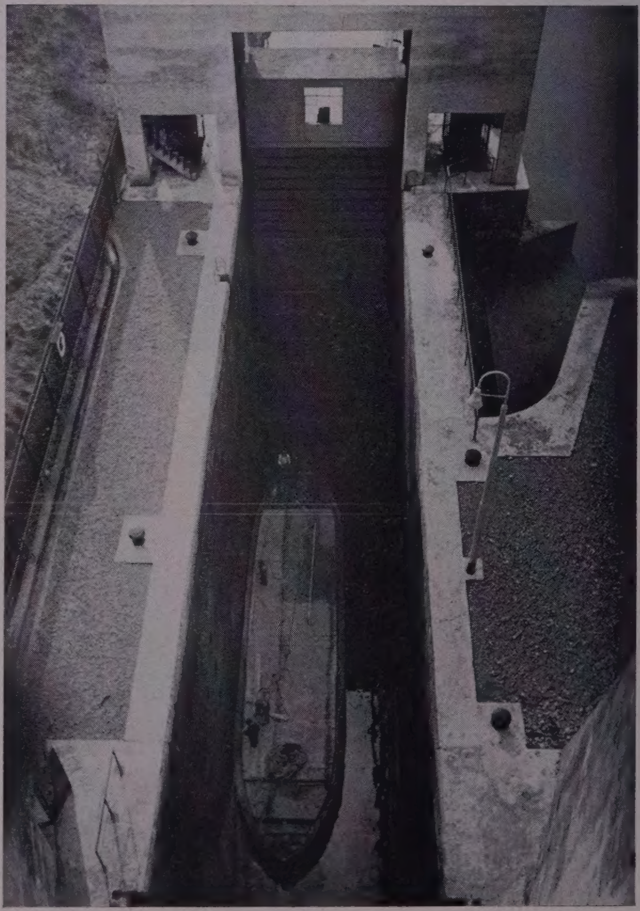
A recent development at Killaloe is the modernization of a pleasantly situated hotel on the lakeside, so that several of its rooms now have private bathrooms. Other additions are ample mooring facilities for various types of pleasure craft available for charter, a waterside petrol-pump, slipways, a dry dock, workshops, and, more recently, a water-skiing club.

The following day the barge brought us to another modern aspect of the Shannon, the Electricity Supply Board's station at Ardnacrusha, ten miles or so further down. Since its completion in 1929, this hydro-electric station has supplanted the Atlantic tides in the control of the greater part of the river's rise and fall, and has harnessed the water power of the entire Shannon basin to provide electricity for much of the Republic.

At Ardnacrusha, two locks link the dammed-up waters of the upper Shannon and Lough Derg with the tidal basin of the lower Shannon below the power station. The barge moved slowly forward into the first of the fifty-foot-deep locks, and the gates by which we had entered closed behind us. Then the seething level of the water began to fall, and the barge with it. As we sank into deeper and deeper gloom I noticed that the helmsman kept the engine running, whilst the deckhand

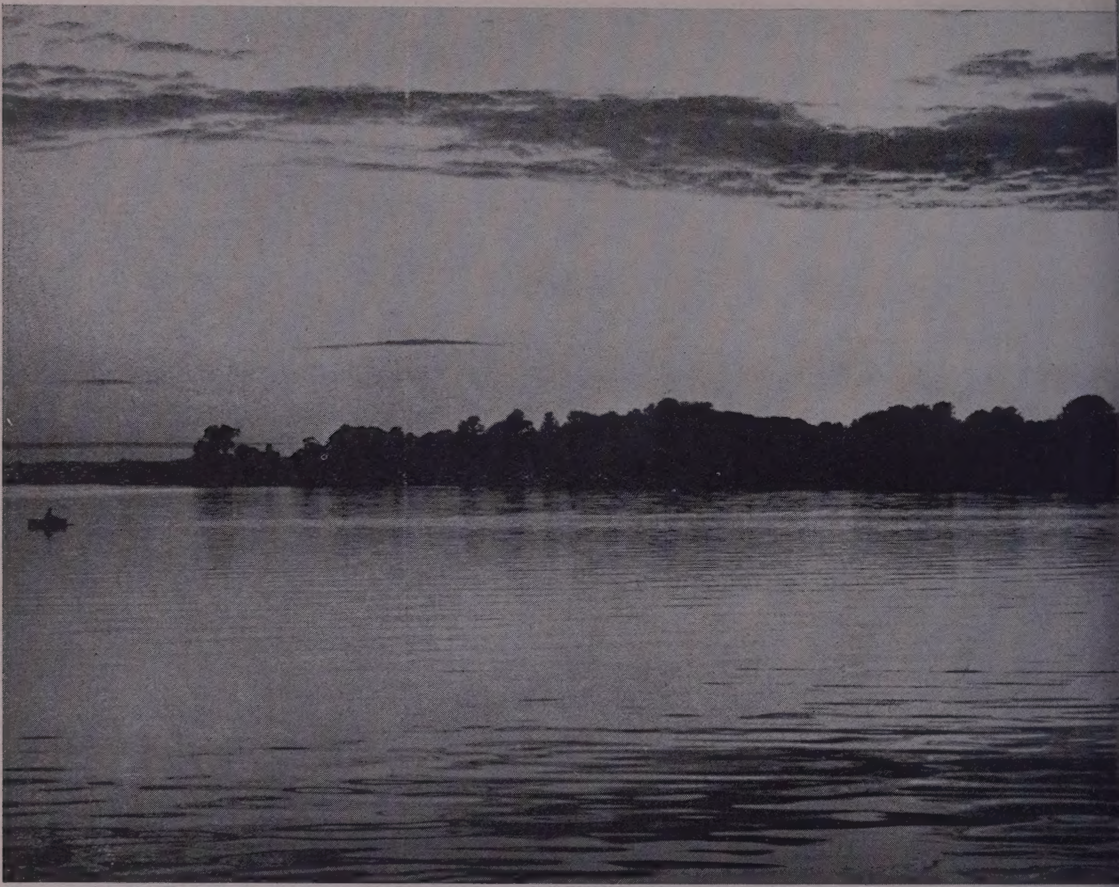


Both photographs by courtesy of the Electricity Supply Board, Dublin



(Above) *At Ardnacrusha, two miles north of Limerick town, is Ireland's largest hydro-electric power station.* (Right) *Beside it two locks raise and lower craft 130 feet between the Shannon's tidal and non-tidal waters.* (Opposite) *Shannon Airport is a sort of aeronautical Clapham Junction, with a Duty-Free Shop and all the wonders and mysteries of modern travel. It is fifteen miles in distance and a whole space age in time away from the put-putting of river-craft, the Celtic remains and the scattered farmsteads that are the familiar scenes on the Shannon's banks*

Both photographs by courtesy of the Shannon Free Airport Development Authority



By courtesy of the Irish Tourist Board

The tidal estuary of the Shannon. From Limerick to the open sea is a distance of seventy miles

fended the craft off from the walls of the lock chamber. Soon the portcullis-type entrance to the second of the lock chambers came into view and slowly rose. Passing under it, we moved into the second chamber; we were hydraulically lowered again and so reached the tidal section of the Shannon. Limerick, the destination of our barrels of porter, lay a few miles further on.

Fifteen miles beyond Limerick, on the northern shore of the tidal estuary, near the edge of Europe, lies Shannon Airport, of which Shannon Freeport is an important and relatively new section. Established by the Irish Government, and the first of its kind in the world, its free-trade zone is exempt from the laws relating to the import and export of goods from and to countries outside Ireland. Finished goods, part-manufactured goods and raw materials of all classes, except such things as narcotics and fire-arms, may be brought into the free-trade area in any quantity. Furthermore, goods may be manufactured, assembled, packaged, processed, mixed, graded, cleaned, marked and handled in any way without customs supervision.

An interesting aspect of Shannon Freeport is the Duty-Free Shop, notable for the wide range of bargains available to all airline passengers who embark there or pass through. Irish merchandise is represented by clothing of all kinds, toys, Irish linens and Waterford crystal glassware. An international contrast is provided by Cashmere knitwear, cameras and accessories, mechanical novelties, Wedgwood pottery, Swiss watches and famous brands in French perfumes.

I came out of the Duty-Free Shop with the feeling that nowhere, probably, could a visitor see an untouched rural district, such as I had so recently sailed through, still vivid with fragments of early Christian mysticism, so close to the sophistications of a busy airport. The Shannon waters link two worlds.